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No. 1

Union Loop Power House.

Inasmuch as the Union Loop is used jointly by the three elevated-railway companies of Chicago now in operation, it is of much importance that there be no interruption in the service of electric power used to move the trains upon it. Therefore the power plant of the Union Elevated Railroad company has been designed to carry the heavy and suddenly fluctuating loads on the loop structure with a maximum factor of safety. The boilers, engines and generators provide a reserve of 50 per cent. above the greatest demand that has yet been made on the station, and possess capacity nearly three times as great as the average load; many of the auxiliaries, such as boiler-feed pumps, fuel-oil pumps, circulating pumps, etc., are installed in triplicate to provide against all contingencies; and in every respect the plant has been very solidly and generously equipped to insure easy continuity of operation under any emergency that can be

fuel, and this fact makes for convenience in operating a station of this description. Of course, the idea in erecting a two-story power house was to effect a saving in the value of the ground area. The loop is in the central business district of the city, and, to follow the plan of simplicity and lack of complications, it was necessary to erect a direct-current station near it. Thus the value of the land had to be carefully considered. The Union Loop power house is

loop is an oblong, double-tracked elevated structure about two miles long in Lake street, Wabash avenue, Van Buren street and Fifth avenue. It belongs to the Union Elevated Railroad company, controlled by Mr. Yerkes, and serves as the downtown terminal of the Lake Street, Metropolitan and South Side elevated railroads. It will also be used for the same purpose by the Northwestern Elevated Railroad company when its road is built. The Union Elevated

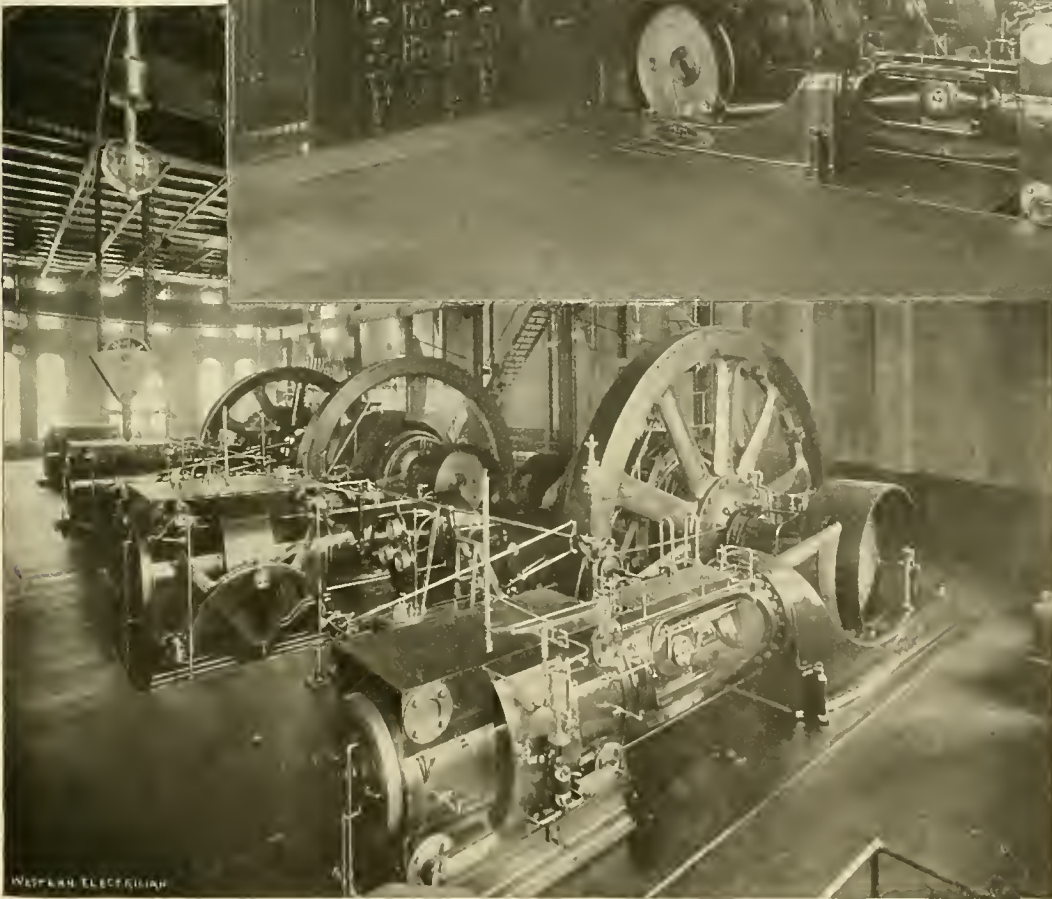
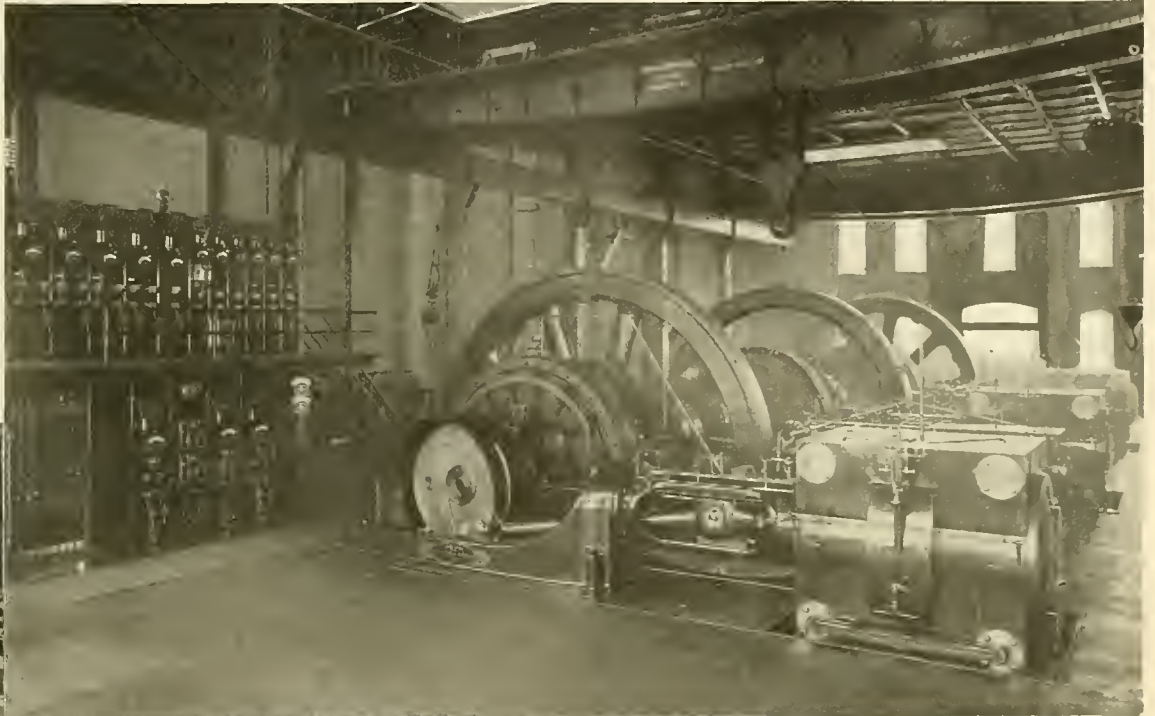


FIG. 1 UNION LOOP POWER HOUSE.—VIEWS IN THE ENGINE ROOM.

forseen. Complications have been avoided, even at the possible sacrifice of some economy in operation.

An especially interesting feature of the station is its "double-deck" design. It has two lofty stories, with a hanging floor between, and the boilers are placed in the upper story, over the engines and generators and more than 50 feet above the street grade. In the basement is installed the auxiliary steam apparatus, condensers, separators, feed-water heaters and pumps. The hanging floor under the boiler room carries the smoke flues to the stack and gives room for coal and ash-handling machinery, if the latter shall be installed. At present oil is used as

one of very few stations in the West built on this plan.

The Union Loop has been in regular service for its whole extent since early in October, 1897, and work on the power house was begun over two years ago. But the completion of the generating plant was delayed by workmen's strikes and delay in getting machinery, and the station has only recently been completed, although one unit has been in use for several months. In the interval power was obtained from the surface-railway plants of the companies controlled by Mr. C. T. Yerkes, principally from the Hawthorne avenue station of the North Side company. The

Railroad company does not operate any cars, but leases the structure to the other four companies and furnishes electric power to three of them. The loop structure itself and its electrical fixtures have been described in previous articles in the *Western Electrician*. All the current for the trains on the loop is furnished by the plant described in this article.

The location of the power house is on Market street, opposite Congress street. The site is within one block of the elevated structure of the Metropolitan road and three blocks from the nearest point on the Union Loop itself. As will be seen by the plan (Fig. 4, page 21, it is of irregular shape. The building faces on Market street and extends back to the South Branch of the Chicago River. A general exterior view of the power house is given in Fig. 2, and Fig. 3 is a longitudinal section (from east to west) through the building.

In putting in the foundations much care was exercised, owing to the weight of the machinery and building and the character of the soil. The edifice and its contents rest on 1,572 piles, each 50 tons on each pile. The building has a street frontage of 142 feet and a depth of 164 feet. The rear elevation extends 62 feet along the river. The height of the street front is 98 feet. The walls are strongly built of brick, the facing on the street front being of pressed brick, and the heavy weights are supported on massive iron girders and columns and piers of masonry in the usual manner. Strength and solidity are characteristics of the whole plant—precautions which are, of course, particularly demanded in a power house of this description. The stack is 240 feet high, square at the base and octagonal

above. It is built of brick and the base is 23 feet square. The flue is round and 13 feet in diameter. The boiler flues enter the stack at an elevation of about 50 feet above the ground. Combustible building materials have been avoided; the floors are of steel plate, the stairways of iron, and the building is as near fireproof as it can be made.

Fuel oil from Indiana is received at the power house in tank wagons. It is stored in tanks having a capacity of about 2,000 barrels, and pumped to the boiler room as needed. The plant for pumping, storing, circulating and burning the fuel oil is an exceptionally large one and has been carefully worked out. It was installed by the National Supply company. In the picture of the boiler room (Fig. 5, page 3) the fuel-oil circulating apparatus is shown at the right. This picture is taken looking toward the eastern or street front of the station. There are 16 Babcock & Wilcox 400 horse power water-tube boilers, arranged in eight batteries on either side of a central open space. The boilers have each about 4,000 square feet of heating surface. As before stated, the flues are connected with the stack through the hanging floor beneath. The plant has not yet been equipped for burning coal any farther than the setting of the boilers with Acme furnaces. However, there is ample room for coal and ash conveyors, hoppers over the boilers, etc. The site has the advantage that coal could be received either in front, from wagons, or from barges on the river in the rear.

All the steam accessories for this plant are placed in the basement. Situated on the river bank, the plant is naturally a condensing one. Three Wheeler surface condensers, with Blake marine-type air pumps, are installed. One of these is illustrated in Fig. 9 (page 5), which is a view taken in the basement. The water for condensation is obtained from the river, the circulating pumps being of the centrifugal type. The water for boiler feeding, however, aside from that obtained from the condensers, comes from the city mains. But it is confidently expected that the early completion of the drainage canal will so improve the river water that it may be used for the boilers. The feed-water pumps were made by the George F. Blake Manufacturing company and are vertical, duplex and piston-packed. The feed-water passes through horizontal heaters located between the low-pressure cylinder and condenser of each engine; thence it passes into vertical heaters supplied with exhaust steam from the auxiliary machinery, and from these heaters it goes to the boilers at a temperature of about 210°. All the heaters were made by the Wheeler Engineering company.

The steam piping is arranged so that the risk from damage on account of breakage is reduced to a minimum. Three main vertical supply pipes from the boiler room to the basement pass through the engine room, back of the engine cylinders and close to the brick wall, and these are the only steam pipes to be seen on the engine-room floor. The separators are located in the basement, as well as the reheating receivers, operating valves, grease extractors, etc. The return of all water of condensation is effected by a Holly return system. All piping from which any heat could be lost is covered with the H. W. Johns asbestos-sponge material.

Two illustrations of the engine room are given on the first page (Fig. 1). This is the main floor of the building, nine or 10 feet above the street level. It contains three large engine-dynamo units and room for a fourth (see Fig. 4), two overhead trav-

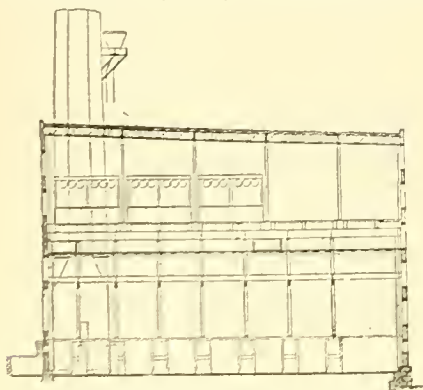


FIG. 3. UNION LOOP POWER HOUSE.—LONGITUDINAL SECTION.

eling cranes and three smaller post cranes over basement hatchways, the switchboard and the office of the engineer in charge. There is also a long iron stairway leading to the boiler room above. Of the two photographs reproduced in Fig. 1, the upper one is the view looking west toward the river; in the lower one the spectator's eyes are turned toward the eastern or street front of the building.

Cross-compound, condensing, slow-speed engines are used. They were built by the Corliss Steam Engine company and drive Siemens & Halske generators, mounted on the main shaft, with the fly-wheel, between the cylinders. The three engine-dynamo units are duplicates in every respect. The engines have the type of valve gear perfected by George H. Corliss before his death. The cylinders are 30 and 60 inches in diameter by 60 inches stroke. The fly-wheel are 25 feet in diameter, and the rim

weighs 25 tons. Hollow-forged, fluid-compressed steel is used for the shaft, which is 26 inches in diameter at the flywheel hub and 22 inches in the bearings. The engines are run at 75 revolutions per minute and are rated at 1,750 horse power each at the most economical point of cut-off, but are capable of exerting 2,500 horse power each at a later point of cut-off. They are equipped with Monarch speed-limit governors and automatic safety stops.

Oil for lubrication is distributed by a gravity system. Distributing tanks for both engine and cylinder oil are located on the wall of the engine room, about 30 feet above the floor. The engine oil, after it has been used, flows to an oil filter in the basement, thence to a storage tank, from which it is pumped to the distributing tank. There is a separate storage tank for the cylinder oil. All new oil is delivered



FIG. 2. UNION LOOP POWER HOUSE.

into the storage tanks, and there are separate pumps to supply the distributing tanks.

The generators are of the internal-field type, made by the Siemens & Halske company, but they have separate commutators at the side instead of the arrangement for commutation directly on the exterior of the armature which is familiar in this company's machines. The generators have 16 poles and, of course, turn at 75 revolutions per minute. They are wound for an electromotive force of 550 volts, and the nominal capacity of each is 1,500 kilowatts. The armatures are keyed directly to the engine shafts and can be readily slipped toward the flywheel should it be necessary to remove a field spool. Any armature coil can be easily replaced without disturbing the adjoining coils, and as there is but one layer of coils on the armature core the facilities for inspection are exceptionally good. The armature bands are sectional and arranged for tightening with lugs and draw bolts in the same manner as the hoops on large-sized water tanks on railroad lines.

A close-by view of one generating unit is given in Fig. 6. The high-pressure cylinder is on the right.

Two overhead traveling cranes, hand-operated, built by Pawling & Harnischfeger, span the space over the engines and dynamos, as shown in Fig. 1. These cranes have a lifting capacity of 35 tons each, and, of course, both can be used together if desired. There are also three eight-ton post cranes placed at the hatchways opening to the basement, as indicated on the plan (Fig. 4) and shown prominently in Fig. 8.

A front view of the switchboard is given in Fig. 7, and the back of the board is shown in Fig. 8. The board is built between two of the steel posts supporting the girder for the overhead cranes. It is a two-storied affair with panels of polished black slate. The generator panels are on the level of the engine-room floor and the feeder panels are on the gallery above, which is provided with a railed balcony on all sides. The leads from the generators are laid under the floor to the switchboard, and the feeders from the latter are conducted from the power house to the elevated structure in ducts underneath the surface of Market street.

Five panels make up the lower board—a wattmeter panel in the center and two generator-controlling panels on each side. Each generator panel is supplied with a positive and a negative switch, having a carrying capacity of 3,500 amperes. Besides these large switches there is a Weston ammeter, a General Electric circuit-breaker and a Siemens field switch on each generator panel. The wattmeter panel carries two instruments, each of 7,000 amperes' capacity, and also the switches controlling the lighting circuits in the building. Two voltmeters are mounted on an insulated swinging frame on one side of the board in the manner shown in Fig. 7.

Feeder panels in the gallery may be enumerated

as follows: Four, of 3,500 amperes' capacity each, for the loop proper; one, of 500 amperes, for the lighting circuit on the structure, including lamps for ticket stations, platforms, street intersections, signal towers, etc.; five, of 800 amperes each, with wattmeter, that may be used for supplying current to surface electric-railway lines controlled by Mr. Yerkes and operating in the business district. In addition to the 10 panels named a special "emergency panel" has been recently installed. It is equipped to carry 5,000 amperes to supply the South Side elevated railway beyond the loop in case of interruption of that company's power from its station at Fortieth street. For this purpose a special emergency feeder is in position on the Van Buren street leg of the Union Loop. Each of the feeder panels has a Weston ammeter and a General Electric circuit-breaker.

The distance from the power house to the elevated structure is 800 feet. The positive and negative feeder cables are carried underground for that distance in three-inch cement-lined ducts. There are 12 cables of 1,000,000 circular mils area each, for the negative side, while the amount for the positive feeders is in excess of 17,000,000 circular mils. The outgoing feeders beneath the switchboard are shown in Fig. 9. At the structure the cables are carried up the supporting columns in three-inch iron pipes bent to conform to the conditions encountered at each location. Four columns, with a manhole at the base of each, are used for this purpose.

All of the lessee companies give an all-night service, so that the Union Loop power house is operated continuously. The maximum engine capacity of the plant is 7,500 horse power, but so far the heaviest load has not exceeded 4,000 horse power. Ordinarily one unit is sufficient for the midday load, while there is a light load for two engines during the rush hours. The variation in load is from a maximum of 6,000 amperes at 6 p. m. to as low as 250 amperes in the hours after midnight. The fluctuations in load are excessive, a swing from 250 to 3,000 amperes having been observed at 4:30 p. m., within a period of 20 seconds. These conditions were carefully considered in designing the station, and all parts are made of ample strength and capacity in consequence.

The mechanical and electrical supervision of this large and interesting plant is in charge of Mr. James R. Chapman, who designed the electrical features of the station and the loop structure, and is manager of the electrical department of the North and West Side surface street-railway systems as well.

Foreign Exhibitions for 1899.

The British government has extended an invitation to the United States to take part in the Western Australian International Mining and Industrial Exhibition, which is to be held at Coolgardie in March, under the patronage of the government of Western Australia. The opportunity afforded to American exhibitors is one of especial value and importance, in view of the fact that Western Australia, by its rapid development, its great resources and its unlimited prospects, affords exceptional openings for American goods. The exhibition will be intercolonial in its character, and will be attended by many visitors from the whole of Australasia. The following, among other classes of manufacture, will find special scope for exhibition, and, if so desired, of

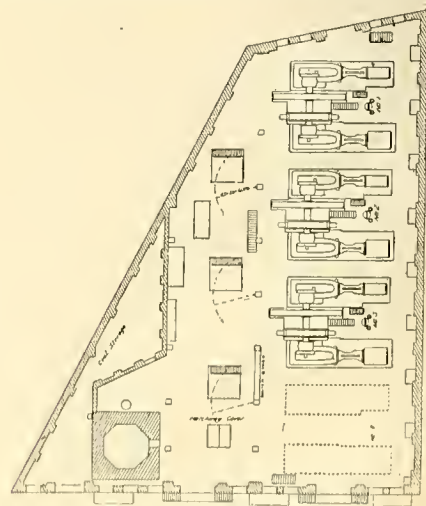


FIG. 4. UNION LOOP POWER HOUSE.—PLAN OF ENGINE ROOM.

sale, viz., electric motors and lighting apparatus, wire and electric appliances of various kinds. The exhibition will be opened on March 21st and will continue for a period of at least three months.

The attention of the electrical industry is also called to the fact that a provincial exposition of East Flanders will be held at Ghent during the summer, being opened on June 14th. While the principal exhibits will naturally be made by residents of the province, there will be a department for foreign exhibitors. The exposition will furnish the best opportunity ever offered to introduce electrical goods to the markets of Ghent and the two Flanders, and is worthy the attention of American manufacturers

and exporters. American manufacturers have been quite successful in introducing electrical apparatus, not only for lighting purposes, but especially for the transmission of power, and the forthcoming exposition offers them an opportunity to still further increase their lead in the Belgian market.

An international electrical exposition and congress of electricians will be held next summer at Como, Italy, the birthplace of Alexander Volta, the discoverer of the electric pile. The exposition will illustrate the progress of electricity during an entire century, and the congress of electricians will treat of the most recent scientific progress and of the numerous applications of electricity. The exposition will be opened on May 15th and will continue in progress until October 15th.

Underwriters' National Electric Association.

The special committee of the Underwriters' National Electric association to prepare specifications for wire coverings and to compile a list of fittings acceptable for use under the electrical code will meet at the offices and laboratory of the Electrical Bureau of the National Board at 157 La Salle street, Chicago, January 9th, and continue in session until the work is completed.

The committee is composed of W. H. Merrill, Jr., chairman; J. C. Forsyth of the New York Board of Fire Underwriters, E. V. French of the Associated Factory Mutual Insurance Companies, William McDevitt of the Philadelphia Fire Underwriters' as-

"The above table is based upon the following formula, which may be applied for conductors larger than No. 0000.

"Rubber diameter = $\frac{2}{3}$ copper diameter + 62.
 "Thickness of rubber wall = $\frac{1}{4}$ copper diameter + 31.

"As the dielectric strength of a rubber wall is determined by its thinnest portion, all measurements shall be taken across the smallest diameter of the specimen tested. When depressions are caused by the braid or in process of manufacture, the lower surfaces of the channels caused by these depressions must be taken as the exterior surfaces of the wall. For a correct reading the measuring instrument must just shut out a line of light between the material being measured and the terminals of the instrument.

"All of these insulations must be protected by a substantial braided outer covering sufficiently strong to withstand all abrasion it will meet with in practice and sufficiently elastic for all wires smaller than No. 5 B. & S. gauge to admit of the conductor being wound back over itself without injury to the braid.

"The completed covering must show an insulation resistance of at least 100 megohms per mile, throughout eight weeks' immersion in hydrant water at ordinary temperatures. Each foot of the completed covering must show a dielectric strength sufficient to resist throughout five minutes the application of an alternating electromotive force of 16,000 volts, under the following conditions:

"The source of alternating electromotive force shall be a transformer of at least one kilowatt capacity.

submitted to the United States attorney-general, with a view to having the question submitted to the United States court on an agreed statement of facts.

The final reply of Commissioner Scott was:

Internal-revenue taxes are not collected through the courts and the decision of the commissioner of internal revenue on the subject is authoritative. Courts can be appealed to after the commissioner's decisions have been complied with and not before.

The commissioner adds that if the internal-revenue officers find that the express company has been failing to comply with the law, steps must be taken to collect arrearages by process of law, if necessary.

Y. M. C. A. Electrical Club Banquet.

The third annual banquet of the Chicago Central Young Men's Christian Association Electrical Club was held on Wednesday evening, December 29th. This club has a membership of fifty, and is composed of young men who are employed in electrical or allied pursuits, many being members of the electrical classes of the association's evening college. One of the features of the event was the unique menu card, which was a novel blue print. The program consisted of the following toasts:

- "The Past of the Club".....Secretary H. H. Harwood, McIntosh Battery and Optical company.
- "Selling Things".....George W. Paterson, American Circular Loom company.
- "The Wright Demand Meter".....Albert G. Turnball, Chicago Edison company.
- "The Press".....Cloyd Marshall, Street Railway Review.
- "Experiences of a Wireman".....J. T. Rumble, Chicago Edison company.
- "Our Menu Card".....Albert G. Courtright, Arnold Electric Power Station company.
- "War Experiences".....B. R. T. Collins, Chicago Edison company.
- "The Future of the Club".....President H. A. Seward, Chicago Edison company.

Mr. George A. Damon was toastmaster.

Secretary Harwood in his response reviewed the many practical talks and discussions on electrical subjects, and mentioned the numerous excursions to points of electrical interest which had been conducted by the club. He traced briefly the movement which has resulted in the establishing of an electrical laboratory by the club, with an equipment largely donated by the commercial firms of Chicago. The club holds the record for entertainments, having conducted one of the most successful special events ever held in Association Hall. Y. M. C. A. managers consider the movement a model of its kind, and the club's 32-page announcement, which was issued in the fall to describe its work, has been sent all over the country to serve as a model for similar clubs in other cities.

American Currency in Porto Rico.

A good story is told by a correspondent from San Juan, Porto Rico, regarding the difficulties experienced in maintaining a standard for American currency when the United States took possession of the country. The unsettled rate of exchange, official and commercial, of the American gold dollar and the Porto Rican silver peso is perhaps the most perplexing feature of the present reconstruction period, not only to former residents but also to the daily increasing colony of business men from the United States. When the American troops first landed on the island, General Miles established by military law an official exchange rate of two pesos for an American dollar. This ratio became the commercial rate at first, but the native merchants soon refused to accept \$1 for goods marked two pesos.

The office of the English cable company, in the meantime, did business at a special English rate, which, based on American gold and Porto Rican silver, was nothing more or less than the two-for-one ratio. The few persons who knew of this little silver mine immediately became patrons of the cable service. For \$1.17 a word they could send a message to the nearest foreign office, St. Thomas Island, and then, by reason of the small amount of American bills and silver in circulation, get pesos in change for their gold at the desired rate. What message and to whom to send it were difficulties easily overcome. If the Americans happened to have friends at St. Thomas, so much the better. On the other hand, if not acquainted there, the Yankees could cable to men whose names appeared in the St. Thomas newspaper. Most of these messages, the clerk remembered later, consisted of one word and were always accompanied by a double gold eagle. Thus their senders, after paying \$1.17, or 2.34 pesos, for the one word, received 37.66 pesos in return, 7.66 pesos more than they could get for the same gold piece on the street. At the other end of the wire, naturally, the receivers of these short cablegrams were greatly puzzled. In one instance a newspaper correspondent recognized the name of an old friend after the word: "Buy."

"What?" cabled back the correspondent.

"Nothing," replied the American.

"Are you crazy, old boy?" inquired the St. Thomas correspondent, not by cable this time, but by the first mail steamer.

"No, my old chum," wrote the new San Juan resident, who, unexpectedly, had a chance to cash another double eagle by the cabled reply of his friend; "I merely sent the message in order to get pesos in change from the cable company." But within a week the cable manager himself discovered his unprofitable trade and refused to pay out any more pesos.



FIG. 5. UNION LOOP POWER HOUSE.—BOILER ROOM.

sociation, A. M. Schoen of the Southeastern Tariff association, J. E. Cole of the Boston Wire Department and Edward B. Ellicott, city electrician of Chicago.

Acting with the committee will be E. A. Fitzgerald of the Underwriters' Association of New York, A. E. Braddell of the Underwriters' Association of the Middle Department, J. M. DeCamp of the Suburban Underwriters' association, Franklin H. Wentworth, Theodore Varney, W. S. Boyd and Benjamin H. Glover of the Electrical Bureau, and a number of other officials.

The manufacturers of insulated wire have been invited to be present at certain hours during the meeting when the experimental records on their products will be under discussion. The following specifications for rubber wires, prepared by the Electrical Bureau will come up for action:

40. Wire Insulation.

"(a) Rubber. Insulating compounds containing rubber must conform to or be in excess of the measurements given in the following table, which shows standard thickness of insulating walls for standard wires and cables:

B. & S.	Mils. Thickness of wall.	Mils. Diameter over rubber.
18	.0411	.122
16	.0437	.138
14	.0469	.158
12	.0512	.183
10	.0565	.215
8	.0631	.255
6	.0715	.305
5	.0764	.335
4	.0821	.368
3	.0883	.406
2	.0954	.448
1	.1033	.496
0	.1122	.549
00	.1222	.609
000	.1334	.676
0000	.1460	.752

The application of the electromotive force shall first be made at 4,000 volts for five minutes, and then the voltage increased by steps of not over 3,000 volts, each held for five minutes, until the rupture of the insulation occurs. The tests for dielectric strength shall be made on a sample of wire, one foot of which is submerged in a conducting liquid held in a metal trough, one of the transformer terminals being connected to the copper of the wire and the other to the metal of the trough."

War Tax on Telegraph and Express Business.

The commissioner of internal revenue has directed Collector Treat of New York to inform Frank H. Platt, representing the United States Express company, in an appeal from the decision of the commissioner, that the rulings of the commissioner are authoritative and cannot be overruled by any other executive officer, and that an appeal to the courts can only be made after taxes have been paid and application for refunding rejected by the commissioner. The letter was called forth by a communication from Mr. Platt, saying that the United States Express company does its business in the transfer of money by telegraph, and asking the liability to the stamp tax of such transactions. Mr. Platt said that Deputy Collector Wood had informed the company that these telegraphic orders were taxable at the rate of two cents per \$100 or fraction thereof. The internal-revenue office holds that the transactions call for a two-cent revenue stamp on the money order and a one-cent on the telegraphic order of payment. Mr. Platt then said:

As this is a legal question, on which there is room for reasonable difference of opinion, and as we think that the decision of the commissioner of internal revenue is not in accordance with the law, may we suggest to you that the matter be immediately

The Region of the Upper Air.¹

BY PROF. JOHN TROWBRIDGE.

At the paltry distance of 10 miles above the earth the air is too thin to support respiration, and the thermometer would register far below zero. A person in a balloon could not hear a friend in a neighboring balloon, even if they were near enough to shake hands. There would be no medium for the propagation of sound waves. There would,

occupants. The boat was 15 feet long, but it is intended to build one to hold six men. The man in the conning tower can manipulate the vessel or it can be manipulated from below. The submarine war machine is built of brass and is thicker on the under side than on top, to give it trim. The engines are placed amidships. They drive a shaft which turns the stern-wheel. In addition to this propeller there is another which works at the end of a vertical shaft directly under the center of the craft and causes

Saitaro Oi, Tokyo, Japan; Francis E. Tyng, Cranford, N. J.; Arthur J. Wood, Brooklyn, N. Y.

Pacific Cable Project.

On December 31st Secretary Hay disapproved the contract entered into between the Hawaiian government, subject to the approval of the United States, and the Pacific Cable company of New York. The action of the secretary is in accordance with the terms of the contract, which provides that it shall not take effect if disapproved by the State Department within six months from July 2, 1898. The contract gave the Pacific Cable company exclusive cable rights between Hawaii and the United States and Japan, and the determination of this government not to grant such exclusive privileges is responsible for its revocation. It is believed that the administration favors a government cable, and that a bill will be introduced in Congress immediately, providing for the establishment of means of telegraphic communication between San Francisco, Hawaii, the smaller islands in the Pacific, where provision has been made for cable stations, the Philippines and Japan.

The Hydrographic Office of the navy is to begin a survey of the route over which the contemplated cable from San Francisco to Manila is to pass. That portion of the path to be traversed which lies between the coast of California and the Hawaiian Islands was carefully mapped some years ago, but the remainder of the track from Honolulu to Luzon is as yet unexplored. The character of the bottom, which has to be considered in the laying of submarine wires, is unknown, and there are not even any figures as to the depths, save for a few scattered soundings at intervals of hundreds of miles.

The cable will go by way of Hawaii, of course, and thence to one of the islands of the Caroline group. The distance from Honolulu to Wake Island is 2,000 nautical miles; from Wake Island to Guam 1,300 miles. The next stretch will be 1,372 miles from Guam to the Gulf of Dingala, which is on the coast of Luzon. To reach Manila, it would have to go around the Island of Luzon, and it will be a great saving of cable and of trouble also to make the landing on the east side, connecting with a telegraph crossing Luzon to Manila—only 38 miles.

If the distance from Honolulu to San Francisco, 2,089 miles, be added, it will be seen that the total length of the cable will be about 6,800 nautical miles. It is estimated that the making and laying of the cable will come to about \$1,000 a mile. This includes everything except the preliminary survey, which, being performed by a naval vessel, will not appear as an item in the account.

The survey of the route of the contemplated cable from Honolulu to Manila will not require many months. The track to be followed will be as straight

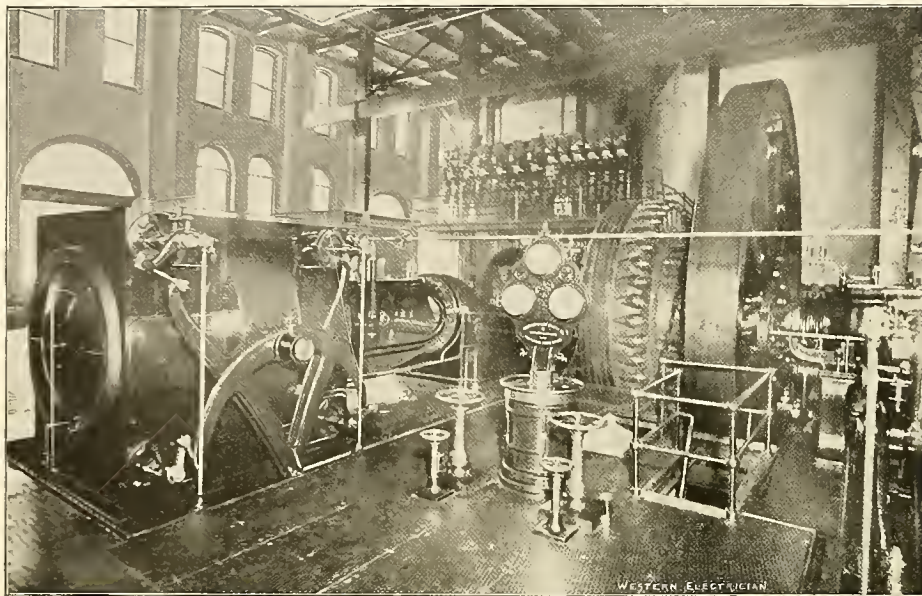


FIG. 6. UNION LOOP POWER HOUSE.—ENGINE-DYNAMO UNIT.

however, still be a medium for the conduction of electricity—a medium, in fact, of great conductivity—almost as good as a metal; and it is this medium at even a less height which Tesla proposes to use in his methods of transmitting power hundreds of miles through the air without wires.

My recent experiences with very high electromotive forces lead me to believe that great difficulty would be met in preventing flow from the generating apparatus to the earth, for, under an electrical pressure of two or three million volts, atmospheric air, even at the surface of the earth, is a fair conductor. Before one reached the height of 10 miles—where there is greatly increased conductivity—the electricity would have deserted the terminal raised to that height and would have flowed to the ground instead of taking the path through the air to the distant station.

If, however, the upper regions of the air are practically employed for the transmission of power, the astronomical observers will be compelled to change the sites of their observatories to deserted mountain regions far from the neighborhood of cities; for there would be a fine display of celestial fireworks in the shape of luminous electrical discharges. Practical electricity now claims the earth as its own; it is no longer possible to make magnetic observations in our physical laboratories, on account of the trolley roads. Is it possible that the upper regions of the air will be pre-empted, leaving the astro-physicists no alternative but refuge in some desolate and far-distant region?

Submarine Torpedo Experiments.

Successful experiments have been conducted by the French squadron in the Mediterranean with the submarine boat *Gustave-Zédé* which has been on trial there under very exacting conditions. The *Gustave-Zédé* was launched in 1893 and hitherto has not come up to the expectations of the French Navy Department. The boat is built of bronze, is cigar-shaped, 132 feet long, and measures 266 tons. She is run by electricity supplied by accumulators, and with 720 horse power was intended to make fifteen knots, when submerged, for two hours. In the experiments made in 1894, however, when sunk in from seven to ten fathoms, the best she could do was seven knots. At that time it was reported that her torpedo tubes worked well under water. She carries a crew of eight men. Her accumulators have always given trouble, and though she has remained submerged for several hours, the people on board have suffered. The French authorities believed that the *Gustave-Zédé* was too long and too large generally for the purposes for which she was intended.

Reports have been received in this country regarding the performance of a submarine boat at Sydney, Australia. A former British naval officer, said to be Lieutenant Innes, is said to have been secretly at work on a new submarine torpedo boat which is described as follows: "The boat is cigar-shaped and pointed at both ends. The driving-power was electricity, and compressed air was supplied for the

disappearance and reappearance of the boat. The model was not fitted with torpedo tubes, as this was a matter of detail. The trial was to test the efficacy of the central screw in submerging and raising the vessel. The experiment was eminently successful."

American Institute of Electrical Engineers.

A meeting of the Institute was held in New York on Wednesday evening, December 28th. A paper was read by Mr. Arthur A. Hamerschlag of the New York Trade School on the "Education of Electrical

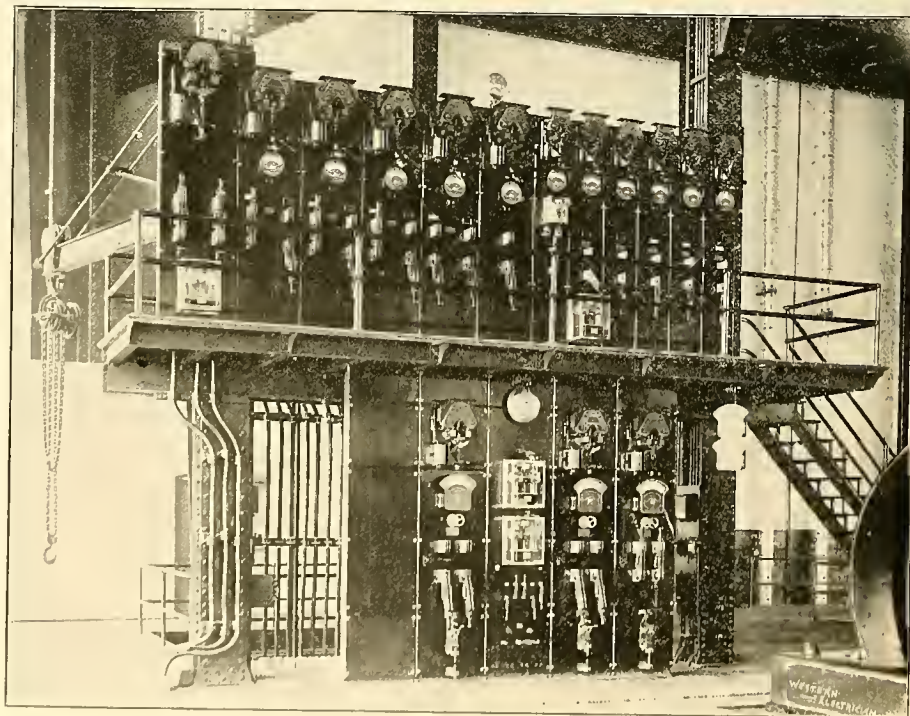


FIG. 7. UNION LOOP POWER HOUSE.—THE SWITCHBOARD.

Apprentices and Journeymen." It was illustrated by lantern slides, showing the work of the electrical classes at the school. Messrs. Wetzel, Lieb, Thompson and Pope participated in the discussion.

At the meeting of the executive committee in the afternoon the following-named associate members were elected: John Allan, Sydney, N. S. W.; John Jacob Bellman, New York; Robinson Crowell, Seleneclady, N. Y.; Henry B. Dates, Potsdam, N. Y.; John C. Finney, Milwaukee, Wis.; William N. Gladson, Fayetteville, Ark.; Leo Walter Hildburgh, New York; William B. Hodge, Philadelphia, Pa.;

as possible from Hawaii to Wake Island, again from Wake Island to Guam, and, finally, from Guam to the Gulf of Dingala. This will be modified only where the bottom is found unsuitable. Drowned mountains may be discovered in the path, and it would be necessary to go around them; or there might be submarine volcanic regions, which are to be avoided, not only because of fear of future convulsions, but also for the reason that the water in such subaqueous territory is apt to contain chemical ingredients that have a destructive effect upon the cable.

¹ From the Forum for January

Printing by X-rays.

[From the New York Sun.]

George Izambard, who has been experimenting in Paris with the Roentgen rays in the hope of adapting them to commercial use in the printing industry, announces that he has succeeded in producing a machine for the purpose. He reasoned that if the X-rays would penetrate oaken logs they ought to penetrate piles of paper, and that as photographs could be taken with X-rays, it ought to be possible to reproduce a picture or printing through every sheet of a pile of paper. The invention is so far matured that M. Izambard is able to expose a pile of paper between two Crookes tubes and print both sides of all the sheets in the pile at the same time. He can also place a series of piles of paper around a Crookes tube, making use of the X-rays by radiating them from a center.

It was suggested many years ago that the printing of the future would be done by electricity, operating, not on single sheets, but on all the sheets of a pile at the same instant. Various inventions have made some approach to a solution of the problem, but none of them has been successful in producing satisfactory printing. M. Izambard's first success was obtained by sensitizing the paper, on the side that was to be printed, with a gelatino-bromide emulsion, such as is commonly used in photography. A pile

on a white surface. Typewritten matter can be reduced in size and reproduced, thus saving the expense of composition.

For printing very large sheets, such as newspapers, M. Izambard uses several Crookes tubes, which are shut off from one another by partitions of a metal not easily penetrated by the rays. Thus the tubes send their rays through the paper in nearly straight lines. The limit of thickness of the pile that can be printed at one exposure is reached when the rays are so distributed as to distort the image. Probably no pile of more than a couple of inches in thickness could be impressed at a single exposure with satisfactory results.

The X-ray-proof ink used is made in part of finely divided metallic or calcareous powder. Bronze, copper, white lead or white zinc may be used. As a writing ink white lead in a solution of gum has been found most satisfactory. When the matter to be printed is first typewritten, the metallic powder is mixed with boiled linseed oil.

A peculiarity of this X-ray printing is that it affords opportunity for printing copies of private or secret matter without the printer's being able to see or read what he is printing. A customer desiring copies of private matter may deliver his copy written in the X-ray proof ink and securely sealed in an envelope. He may also see that the paper on

the consolidation of the Boston and Montana, Montana Ore Purchasing and Butte and Boston mines of Montana, Old Dominion of Arizona, Osceola, Tamarack, Isle Royale, Arcadian and several other Lake Superior mines. A corporation with a capital of \$100,000,000, it is said, will be formed to operate the mines under New Jersey laws.

Electric Railway Competition in Massachusetts.

Considerable interest is taken in the project, which will come before the Legislature at the next session, to enable street railways to carry freight as well as passengers, an express company having been organized to contract with various electric railway lines for that purpose. In Brockton, Mass., at the last meeting of the trade organizations of the city, it was voted to favor and encourage the idea, and urge the electric roads to carry merchandise, the high charges of the steam roads being severely scored. The steam roads are also under fire from residents of the suburbs, who want transportation on the steam cars as low as it is on street-car lines. A hearing was given last week before the railroad commissioners and representatives of the steam roads admitted that their busi-

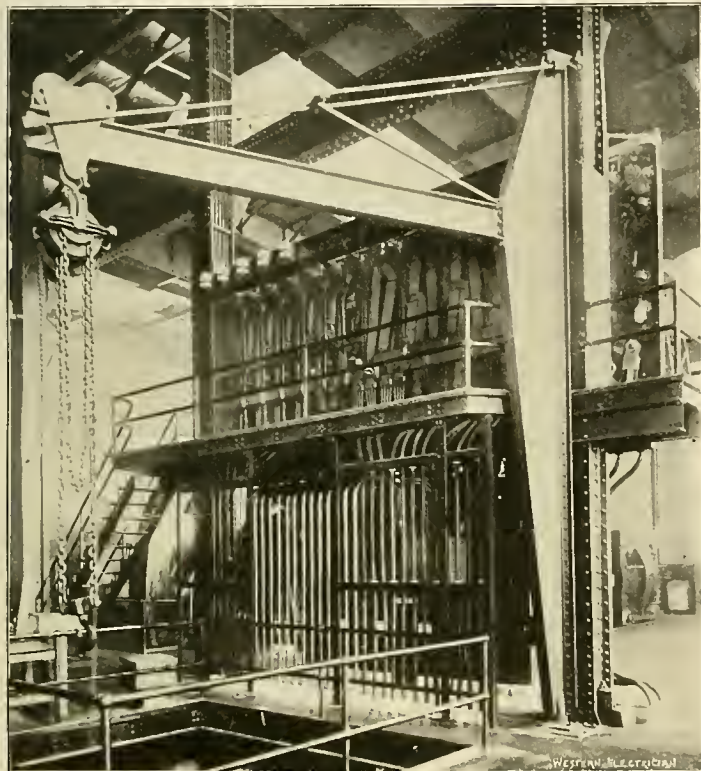


Fig. 8. Rear View of Switchboard, Showing Post Crane.

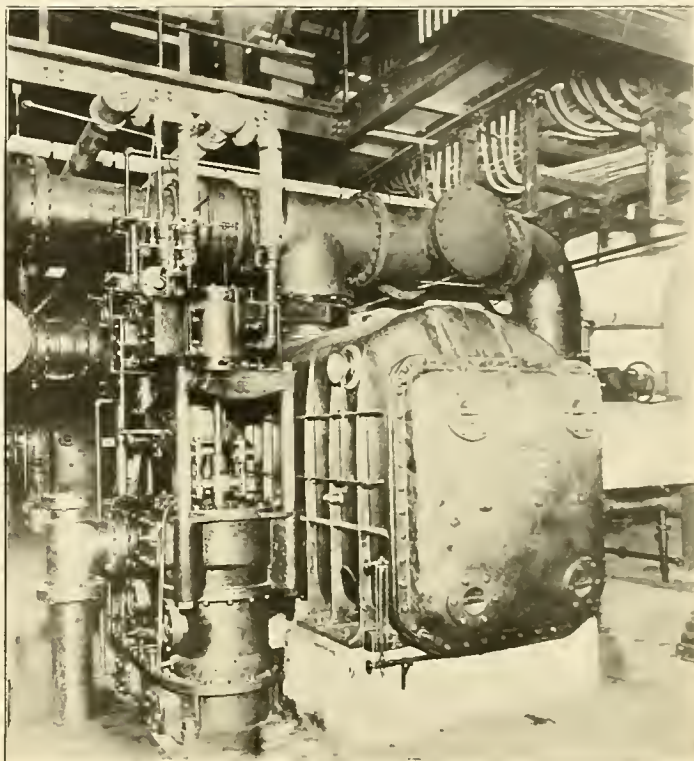


Fig. 9. One of the Surface Condensers.

UNION LOOP POWER HOUSE.

or block of paper thus prepared was placed in a position of exposure to the X-rays. On top of the paper was placed a copy of the thing to be printed. This copy being proof to the X-rays, in a trice the thing was done, and on developing the pile of paper the inventor found a copy clearly printed on each sheet.

To print in this manner, it is necessary that the copy or original shall be nearly impervious to the Roentgen rays and that it shall be placed between the Crookes tube and the pile, where the rays may be directed to it. The copy is preferably first printed or written in what is called radiographic or X-ray-proof ink, composed of a material calculated to intercept the rays. A few seconds' exposure is sufficient to effect the printing through the entire pile of paper, but it is at first invisible and requires to be developed or fixed after the method of a photographer. The piles of exposed sheets are trundled into a red-light room and suspended in vats, where the developing and fixing liquids are applied. Rinsing and drying follow, and the latter may be hurried by mechanical and chemical means. It is apparent that the process is really a sort of wholesale method of photography with the X-rays, and is printing only in the photographic sense of the term.

The inventor admits that there is a difficulty in printing on one side only of the paper, owing to the tendency of the print to show through on the reverse side. He proposes to overcome this by sensitizing the paper in stripes, printing the lines on the stripes, and causing the lines on one side of the paper to fall opposite the spaces between the stripes on the other side. Until he can improve upon this method the process must be limited by these restrictions. To offset this drawback, there are peculiar advantages in the process. It is just as easy to print in white on a black ground as it is black

which the copies are to be printed is securely sealed. Then the printing may be done by the X-rays and the developing executed without once breaking the seals, so that no one through whose hands it passes can know the contents. If desired, the envelopes may even be made of stout canvas or leather and securely locked.

Weather Bureau Warnings for War Department.

During September provision was made, by direction of the secretary of agriculture, to telegraph from the central office of the Weather Bureau at Washington forecasts to commanding officers of the several army corps whenever weather conditions injurious to the health or comfort of troops under canvass were expected in the states where the army corps were located. An appreciation of these forecasts is indicated by the records of the department, which show that, as a result of the warnings sent much suffering and loss were avoided. In a typical case the following report was made: "A severe storm set in here last night and continued this morning. The camp authorities had been warned of its approach by the Weather Bureau, and were prepared for it. Every tent had been strengthened, and the storm did no damage in camp, except to make it cold and cheerless."

Proposed Formation of Copper Trust.

A dispatch from Houghton, Mich., December 29th, announced that Standard Oil men were trying to control the American copper mines. The Calumet and Hecla and Quincy owners have been approached, it was said, but the mines cannot be obtained at satisfactory figures. The plan comprises

ness in the vicinity of Boston had fallen off tremendously in the last two years, largely on account of the cheaper fares and competition of the electric lines.

Electric Railway Litigation.

When a jury in the Supreme Court in Brooklyn brought in a verdict last week for the defendant in the suit of Herman Schienauer against the Brooklyn Heights road for \$10,000 damages for personal injuries in a trolley accident, the court set a new precedent in such cases by awarding to the defendant, in addition to the usual costs, an extra allowance of \$500 on account of the difficulty and expense of defending the action. This, it is believed, will have a tendency to lessen the number of such actions.

Senator William Johnson, receiver of the Union Traction company of Hackensack, N. J., has been ordered by the Court of Chancery to sell the road bed, cars, fixtures, buildings and everything else belonging to that company in Hudson and Bergen counties. The railroad is in operation from North Arlington to Woodridge, a distance of eight miles. The company had secured a right-of-way as far north as Hackensack, but, owing to the demand of that town for \$50,000 for right-of-way, which the company could not pay, it went into a receiver's hands. It was admitted that if the right-of-way had been obtained the company would have been able to float a million dollars' worth of bonds and complete its lines. The Metropolitan Trust company is the complainant in the foreclosure suit. It is understood that at least four competitors will bid at the sale on January 27th.

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CORRESPONDENCE relating to electricity or any of its practical applications is cordially invited, and the co-operation of all electrical thinkers and workers earnestly desired. Clear, concise, well written articles are especially welcome; and communications, views, news items, local newspaper clippings, or any information likely to interest electricians, will be thankfully received and cheerfully acknowledged.

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There seems to be no good reason why the New Year should not indeed be a happy one to the electrical industry. The figures given on another page show that no less than \$70,000,000 worth of machinery and apparatus for electrical plants was produced in the United States last year. The electrical exports amounted to \$5,500,000. Unless all

signs fail these values will be exceeded this year, particularly in the case of the electrical export trade, which has very flattering prospects. It looks as though the lean years had passed and the fat ones are at hand. The outlook is a pleasing one, and, as there is little danger of over-confidence in the electrical industry after the experience of recent years, we may all rejoice.

Havana can now claim to be an American city. There is a full-fledged row on in the Cuban capital over street-railway franchises. Rival interests have secured conflicting privileges, and the principals now propose to fight it out in the courts. There are many prominent American, English, French and Canadian capitalists interested, and as the several corporations seeking privileges have plenty of money there is every prospect that the controversy will be a lively one.

The Northwestern Electrical association claims the attention of central-station men, manufacturers and agents in Chicago, Milwaukee, Minneapolis and neighboring towns. Its annual meeting at Milwaukee in January promises to be a successful gathering—a repetition of former conventions in this respect, but an improvement in others. The organization is deserving of all the success it has enjoyed, and it appears to be determined to win new laurels with each succeeding meeting.

The latest information about the Keely motor is to the effect that a Boston inventor has undertaken the task of finishing the work and putting the machine on the market. What has become of Attorney Collier of Philadelphia, who declared he knew as much about the motor as Keely, and that he could explain everything connected with it? Surely no better time could be selected than the present. The Engineering society of Philadelphia should call upon Mr. Collier to make good his assertion.

It is evident that the present administration appreciates the value of telegraphic communication with Hawaii, the Philippines and Japan in extending foreign trade, and it is not surprising that the franchise for exclusive cable privileges has been refused the capitalists who have been endeavoring to secure these rights. The government will probably undertake the work itself in order to insure American control of the property. It will involve an expenditure of several millions of dollars, but this will not prove a greater burden than the subsidy which it was proposed to give a private company which desired to establish a line to Honolulu. The new cable will prove a valuable feature in extending American trade in the Orient and in protecting American interests in the Pacific. It will place the government at Washington in direct telegraphic communication with Honolulu, Manila and other important points, and the value of these facilities cannot now be fully appreciated. The commercial advantages will be more apparent at the outset, and they will place this country on more nearly an equal footing than it has heretofore enjoyed.

Electric cabs have not proved sufficiently popular in London to make them commercially successful, according to the annual report of the financial condition of the London Electrical Cab company, the accounts showing that since the incorporation of the company on November 12, 1896, to July 31st last a loss of £6,207 has been sustained. Cab maintenance, including electricity, repairs and renewals, has cost £7,121, while the receipts from cab hire amounted to only £3,242. These figures, bad as they are, do not tell the whole story, according to the Financial Times, which says that "among assets are two utterly worthless items, namely, £1,358 for preliminary expenses and £1,609 for general expenditure to August, 1897, the date when the cabs commenced to ply for hire. The sum of £29,364 is set down for expenditure on premises and rolling stock, but nothing, however, is written off for depreciation. It is, therefore, obvious that were this very necessary narrative made the accounts

would show a loss of at least double the figures given." The management is not discouraged, however, and it is announced that improvements are being made that will cut down the expenses sufficiently to admit of profitable operation of the plant.

Considerable prominence is given the statement of Mayor Harrison that during the last year the cost of operating electric street lamps from the city lighting plants of Chicago has been reduced \$21.65 per lamp per year, bringing the present cost down to \$69. It is to be hoped that other claims of the present city administration have more substantial foundation than this. Certainly it would be difficult to imagine an intelligent public man seriously presenting a more absurd proposition than that set forth in the mayor's summary. He says:

The cost of maintaining an arc lamp has been reduced as follows:
Total cost per light, 1897.....\$90.65
Total cost per light, 1898.....\$69.00

Total saving per light.....\$21.65

Central-station managers have never entertained an exalted opinion of the municipal lighting system of Chicago, and while they may agree with the mayor in so far as his statement refers to the possibility of effecting a saving of \$21.65 per lamp per year, they will appreciate the absurdity of the claim that the cost has been brought down to \$69. If Mayor Harrison seeks to give the city of Chicago a business administration, he must adopt business methods in keeping the records of the several departments, and he must avoid issuing misleading statements like the one quoted. No one desires to place the blame upon his administration for the costly and inefficient street-lighting service with which the city was burdened when he assumed office, but he cannot follow the example of his predecessors in misrepresenting the facts as they exist without placing himself in the equivocal position of supporting their policy.

Activity in stock speculation during the closing hours of the old year assisted materially in rounding out an unprecedented experience in the industrial and financial history of the country. An eminent financial writer sees in these manifestations unmistakable evidence of general prosperity throughout the country. Further proof of the revival of activity in business is furnished not only by the consolidation of numbers of industrial corporations, but by the formation of new companies of the same kind. While the managers of the old consolidations are confident of getting business enough to keep all their machinery in operation, their new rivals are equally confident that they, too, have before them a fruitful field from which to harvest profits. It is not to be supposed that they are investing their capital in manufacturing plants from which they can never recover it, unless they believed that they can make it, in that form, productive. No doubt the annual rate of profit will be, for a time, reduced by competition, but, as the country grows and its power of consumption increases, it is fair to assume that profits will increase with it. These views apply particularly to the electrical industry, in which there is unquestionably a most promising field.

The same writer, summing up the outlook for 1899, says:

The new year, therefore, promises, not so much a greater activity and higher prices for stocks as an extension to all kinds of business of the hopeful spirit which has been manifested upon the Stock Exchange. Of political hindrances to the movement there are none of importance. The recent elections assured us of a Republican Congress for the next three years, at least, and the term of the present Republican president will last for two years from next March. The silver specter is practically laid at rest, and there will be no tampering with the currency; the war with Spain is at an end; and the revenue policy of the nation will not be changed by legislation until the change is required by the slow progress of events. The new domain we have acquired will give us a new field for enterprise and investment, and extend the area of our financial as well as our political empire. Whatever, therefore, may happen on the Stock Exchange, the mass of our citizens will do well.

There can be no doubt that the best-informed electrical men of the country anticipate a profitable extension of business and that their opinion is based upon the conditions thus concisely set forth.

THE RECORD AND PROMISE OF THE ELECTRICAL INDUSTRY.

1898 - 1899.

Reviewing the year's electrical development, it is seen that 1898 was a successful but not especially noteworthy year. To all Americans the war with Spain was the great event of the year, but beyond some unnecessary apprehension before the beginning of hostilities and a temporarily increased demand for some classes of apparatus the brief conflict had no great effect on the electrical industry, either for good or ill, although the ultimate industrial effects of the war will undoubtedly be good.

No striking technical advance was made during the year, the development being gradual and along existing lines. Experiments in space telegraphy continue, but no commercial basis of accomplishment has yet been reached. The Röntgen-ray process has been developed during the year to more far-reaching fields of usefulness. It proved its value in hospital service during the Cuban and Egyptian campaigns. The naval operations of the American war also demonstrated anew the value of searchlights, electric motors for mechanical operations, and telephone service on warships, but more complicated electrical devices were not so successful.

Mr. Tesla has announced some startling applications of the theory of electrical transmission through space, but his theories have appealed principally to the speculative and the curious. Similarly, considerable popular curiosity was aroused during the early part of the year by the assertion that Szczepanik, a Pole, had invented an instrument, called the tele-troscope by the English newspapers, to enable one to see at a distance by the electrical transmission of light waves. Nothing has lately been heard of the device, and it is probable that the inventor's anticipations, exploited as facts, were not realized.

Turning to the practical side of the industry, one notes steady improvement in design and methods. Larger units are used in electrical plants and higher voltages for transmission. Several extremely large plants are under way, such as the Metropolitan (70,000 horse power) and Third Avenue (64,000 horse power) railway plants in New York city. The work on the 75,000 horse power water-power development plant at Massena, N. Y., seems to have been delayed. The year has seen a great extension of conduit electric railways in New York city and the increasing use of rotary converters for both electric-railway and electric-light plants. The multiple-unit system of car control has been tested in service and pronounced successful. The enclosed-arc lamp has made a triumphant advance and promises to supersede all open arcs. The 220-volt incandescent lamps and the 220-volt direct-current two-wire transmission seem to have made place for themselves, although not to the extent anticipated a year ago.

Copper has been dear all the year, and in three or four cases bare aluminum conductors have been used on a scale of some magnitude.

It has been a good year for the storage battery, which, after many years, seems to be now winning the favor of American electrical engineers. Many large station plants have been installed. The horseless-carriage industry has made moderate but fairly satisfactory progress.

The telephone field shows untiring activity and excellent progress on the part of the independent companies. Large anti-monopoly enterprises in St. Louis, Cleveland, Indianapolis and other large cities are reported as a part of the year's work. A notable development of the telephone situation during the closing months of the year has been the recognition of the independent companies by the Bell companies. In some cases working arrangements for co-operation were made between the opposing forces, but in most instances the Bell overtures were rejected by the opposition.

The year has witnessed something of an electrical awakening abroad, particularly in electric-railway construction. There has been a decided demand for American electrical machinery in Europe, Japan and other quarters of the globe, and American manufacturers received a number of noteworthy foreign orders during the year. With the expansion of American authority and American territory that has just taken

place, there can be no doubt that American electrical exports will in the future take a far greater proportion of the output of the factories.

Consolidation is the commercial tendency of the age, and it is as evident in the electrical industry as in others. The absorption of the Walker company by the Westinghouse company early in September was an important combination and showed the trend of events very clearly. The operating companies, also, in cities like New York, Philadelphia, Baltimore, Pittsburg, St. Louis and Chicago, as if by a general impulse, "got together" during the year in great combinations significant of the changing methods of doing business.

VOLUME OF BUSINESS.

From the best information that the Western Electrician has been enabled to gather, after diligent effort, the value of the machinery and apparatus manufactured in the United States during the year 1898 for use in electrical plants (including engines, boilers, cars, trucks, water-wheels, etc., used exclusively for such purpose) was about \$70,000,000. Of this product a portion valued at \$5,500,000 was exported to foreign countries. The electrical imports into the country during the year were worth about \$500,000. These figures are based on estimates furnished by a large number of manufacturers and electrical men, supplemented by government figures to the limited extent to which they are available, and are believed to be approximately correct, although it is impossible to obtain the data with exact accuracy.

In the following table detailed estimates are given:

Class of apparatus.	Made in the U. S.	Imported.
Arc lamps, enclosed.....	\$ 500,000	\$.....
Auxiliary steam plant, for electric installations, such as pumps, condensers, separators, feed-water heaters, injectors, piping, etc.....	750,000	.....
Bells, buzzers, push-buttons, call-boxes, annunciators.....	400,000	.....
Belling used in electrical plants.....	625,000	.....
Boilers (water-tube only) for electrical plants.....	2,000,000	.....
Carbons for lamps, batteries or motors.....	1,200,000	100,000
Cars and trucks for electric railways.....	1,700,000	.....
Cranes and hoists, electrically operated.....	750,000	.....
Dynamoes and motors, including parts of machines, boosters, rotary converters, etc., and all motor applications not specifically enumerated in this list.....	20,000,000	.....
Elevators, electric (mechanism only).....	2,000,000	.....
Engines, steam, gas or oil, used to drive electrical machinery.....	12,000,000	.....
Fans, electrically operated and directed.....	550,000	.....
Fixtures for electric lighting.....	3,750,000	75,000
Heating and cooking apparatus, electrical.....	150,000	.....
Incandescent lamps.....	2,100,000	12,000
Lightning arresters.....	150,000	.....
Lights, arc, electrically operated.....	1,100,000	.....
Lights, molting, junction-boxes, brackets, etc.....	250,000	40,000
Primary batteries.....	450,000	.....
Rheostats, car controllers, motor starters, etc.....	500,000	.....
Shafting, pulleys, clutches, etc., used in electrical plants.....	800,000	.....
Sockets, switches, cut-outs.....	1,600,000	.....
Storage batteries, electrically operated.....	2,100,000	125,000
Transformers, stationary.....	1,250,000	.....
Water wheels, used to drive electrical machinery.....	440,000	.....
Wire and cables (rubber-covered wire, \$1, 250,000; weather-proof wire, \$1,000,000; cables, underground, aerial and submarine, \$7,500,000).....	12,750,000	.....
Total.....	\$69,835,000	\$352,000

It will be noticed that the table contains no estimates for electrical measuring instruments, open-arc lamps, telegraph instruments, fire and burglar-alarm apparatus, overhead railway material, bare wire and other less important classes of apparatus. The Western Electrician could, unfortunately, obtain no reliable estimates on these lines. But it is evident that if the figures had been obtained the total would have gone considerably above \$70,000,000. Even if some of the classes are estimated too high, the total of \$70,000,000 for the electrical manufacturing business of the country is still a fair one.

In the telephone field it must be borne in mind that the American Bell Telephone company does not sell telephones or switchboards. Its output for the year was about 194,000 instruments.

To the gentlemen who assisted in preparing the table given above the Western Electrician returns thanks.

MORTUARY RECORD.

Several well-known names are included in the death-list of the year. Perhaps the most famous is that of Dr. John Hopkinson of London, the electrical engineer, who was killed in the Alps on August 27th at the age of 49. Latimer Clark, a prominent tele-

graph engineer, whose name is perpetuated by the Clark standard cell, died in London on October 30th at the ripe age of 76. Camille A. Faure, the French storage-battery inventor, died in October, aged 56. Another name—note or notorious, as one chooses to view it—on the death-roll of the year is that of Dr. Cornelius Herz, whose checkered career was closed by death at Bournemouth, England, on July 6th, after a life of 53 years.

The list of American electrical men of prominence who died during the year is not long, but it still contains but too many familiar names. In chronological order it is as follows:

January 24.—Oliver B. Shallenberger of Rochester, Pa., the talented alternating-current investigator and designer of the instruments bearing his name, at Colorado Springs, aged 38 years.

February 17.—James H. Rhotemmel, president of the Columbia Incandescent Lamp company, at his home in St. Louis, aged 42 years.

February 25.—Dennis Doren of New York, general superintendent of construction of the Western Union Telegraph company, at Norwalk, O., aged 68 years.

March 27th.—Nelson W. Perry, writer on engineering subjects, at his home in Brooklyn, aged 45 years.

June 28.—Alexander Kempt, at one time prominently identified with the arc-lighting business of the West, at his home in Chicago, aged 61 years.

July 6.—John Mason Jackson of Chicago, secretary and treasurer of the Western Electric company, at Honolulu, aged 39 years.

November 2.—Charles H. Summers of Chicago, electrician of the western division of the Western Union Telegraph company, at San Francisco, aged 61 years.

December 20.—Dr. Wellington Adams, who claimed to have originated the idea of mounting electric motors on the trucks of railway cars, at his home in St. Louis, aged 42 years.

December 24.—Ranald T. McDonald of Fort Wayne, president of the Fort Wayne Electric corporation, at Dallas, Texas, aged 49 years.

CONVENTIONS AND EXPOSITIONS.

One feature of the year not to be overlooked is the exceptional number of electrical conventions and exhibitions in the United States.

The Trans-Mississippi and International Exposition at Omaha was very successful, and the electrical exhibits and illumination formed one of its most attractive features. This exposition was open from June 1st to November 1st. The New York Electrical Exhibition in May attracted much attention, particularly a popular exposition of space telegraphy. It was followed by a similar show in Philadelphia in June. There was a fine display of electrical and street-railway apparatus at the annual meeting of the American Street Railway association of Boston early in September, and also at the triennial exhibition of the Massachusetts Charitable Mechanic association in the same city during October and November.

The annual meeting of the National Electric Light association was held in Chicago early in June, and was a well-attended, business-like gathering, distinguished by an exhaustive discussion of the old but important subject of distribution from central stations—whether it should be by direct or alternating currents. Immediately following was the unique excursion-convention of the Northwestern Electrical association on the steamer Northwest while making a voyage from Chicago to Duluth. The winter meeting of the Northwestern association was held in Milwaukee in January. The general meeting of the American Institute of Electrical Engineers was held in Omaha June 27th-20th, and was an important gathering at the most western point yet visited by the Institute. The international meeting of street-railway and electrical men from Texas and Mexico in Laredo, Texas, in March, was an assemblage of considerable interest and significance. The Independent Telephone association met in Chicago June 30th and July 1st and 2d, and effected important changes in the organization. The Municipal Electricians gathered at Elmira, N. Y., on August 9th, and the members of the Association of Edison Illuminating Companies at Sault Ste. Marie on September 12th. The important convention of the American Street Railway association at Boston has been already mentioned. The annual meeting of the Canadian Electrical association was held at Montreal June 28th-30th.

In addition there were meetings of the state associations of electric-light, street-railway and telephone men in larger number than ever before. Many of these were creditably attended and of lasting result, notably those of the Ohio Electric Light association at Sandusky on August 18th and 19th, and of the New York State Street Railway association at Brooklyn on September 13th and 14th.

Electric Railway Development of 1898

By B. J. ARNOLD.

During the year 1898 few electric railways were built in the United States, owing to the larger cities having been previously supplied with roads sufficient to meet the demands, although there were a few additions and extensions made.

Trolley Roads.—While railway construction was somewhat interfered with by the Spanish-American war, there were, however, a number of cross-country or interurban roads built, aggregating probably 250 miles of track, upon many of which were instituted freight and express services. These roads are distributed throughout the United States, several being in Ohio, several in New England, a few in Michigan, two in Illinois, and one in Colorado. They are operated mainly by the standard system of direct-current overhead construction, although three of them derive their power from alternating-current generators, while three others are using direct-current generators with boosters upon the long feeders.

Freighting by electricity has received an impetus by the placing in operation of the Buffalo and Lockport railway, consisting of 29 miles of standard steam-railroad track, upon which is operated a freight and passenger service. The freighting is done by 36-ton electric locomotives of the type used in the Baltimore tunnel, and the passenger service by ordinary eight-wheeled cars. The power is obtained from the Niagara Falls Power company through rotary converters.

Accumulator Traction.—While there have been no additional accumulator or storage-battery roads built during the year, the Englewood and Chicago road (Chicago Electric Traction company) has been operated a sufficient length of time to demonstrate the practicability of the use of storage batteries for traction purposes, both from the standpoint of the public and of the railway company, the cost per car-mile of operation and maintenance now having been fairly well established to be not prohibitively greater than similar costs for overhead trolley lines. The latest reports from the Hanover and Dresden roads in Germany, which operate combined trolley and battery systems, indicate that the systems continue successful and satisfactory and that the costs per car-mile of operation are not excessive.

Conduit Railways.—The underground conduit system has been used by the Metropolitan Street Railway company in New York city on Lenox avenue during the entire year and on other streets occupied by the company for a part of the year, and reports indicate its satisfactory operation.

Underground conduit systems are now being laid in Paris and in Brussels.

The latest railway equipped with the underground conduit system is that of the Capital Traction company of Washington, which has recently completed and placed in operation about 22 miles of track, adopting practically the same system that is used on Lenox avenue, New York. This company also changed over a portion of its old underground system to conform to the new standard. This gives Washington the most complete and extensive underground conduit system in this country.

Contact Systems.—While there have been numerous patents taken out for contact and button railway systems, there have been no lines yet operated a sufficient length of time to demonstrate their practicability, although progress is being made along these lines, which may ultimately bring success, the chief difficulty being in providing a suitable switch for making and breaking the contact with the live section of the conductor which can be operated without rapid destruction. Besides a few experimental lines of this character put down in the United States, there has recently been installed at Monaco, France, a line three miles long, which is said to operate successfully. Each car carries a storage-battery auxiliary and takes its current from two rows of staggered contact points between and parallel to the rails. The company operates six cars supplied with direct current at 500 volts.

Elevated-railway Work.—In elevated-railway work electricity may be said to have demonstrated its superiority, for with all of the Chicago roads operating electrically, and the Brooklyn elevated road under contract to equip electrically, the probability is that the single remaining steam-elevated road must soon follow.

The Chicago South Side "Alley L" road, being the latest to abandon the steam locomotive, has had in use the multiple-unit system, in conjunction with storage-battery sub-stations, for several months, and while the results of its operation have not been published the increase of speed made by the trains, on account of their ability to rapidly accelerate, makes this road superior in its service to any other Chicago road, and the results of operation, from a general standpoint, will be looked forward to with interest by engineers.

The surface road of Pittsburg and Cleveland, operated at 500 volts direct current, have also installed battery auxiliaries with satisfactory results.

Underground Road.—If underground construction in London has taken the lead with the Central London underground railway, which was to have opened for traffic January 1, 1899, 6½ miles of double track, equipped with 22 electric locomotives, each capable of drawing a train of seven cars, with an aggregate weight of 104 tons, at an average speed of 11 miles per hour. This road is probably the

most interesting piece of electric-railway engineering built during the year. It will be driven by three-phase generators through sub-stations and rotary converters, and was the first road, so far as the writer is aware, of any great magnitude, to adopt three-phase transmission. Each station will be equipped with elevators for carrying the passengers to and from the trains. Careful calculations were made to ascertain the probable power required for operating this road, and the result of the tests, showing the actual conditions and cost of operation, will be valuable. It should be borne in mind, however, that the principal reason for adopting alternating-current transmission in this case was owing to a Board of Trade rule limiting the fall of potential of any return circuit to seven volts.

The Waterloo and City railway, an underground road about 1½ miles long, connecting the Waterloo terminus of the London and Southwestern railway with the Mansion House, has also been built and provided with trains which give it a five-minute train service. Each train consists of four cars, capable of carrying 204 persons each. The power consumed by the trains is lessened by the grade of the road being so arranged that the trains start at the station on a down grade, the same plan that was used on the Intranural road at the World's Fair.

The completion of the Boston subway system gives us the first underground road in this country. This subway is built in the most congested portion of the city of Boston, and allows the cars of the different railway companies to pass through it underneath the city, greatly relieving the streets of car blockades, which previously made it so difficult to get around the business portion of Boston near the Common.

Multiphase Roads.—During the year of 1896 a three-phase road three miles long was installed at Lugano, Switzerland, and in 1897 an experimental line was put down in the plant of one of the principal European electrical manufacturers at Budapest, Hungary. The results of the operation of the Lugano road have caused the adoption of the three-phase system for the line between Zermat and Gornergrat, 6.2 miles, also for the Stansstadt and Engelberg road, 13.3 miles, and the Berthoud-Thoune line, 25 miles long. To the success of the Lugano road may also be attributed the adoption of the three-phase system for the Jungfrau electric railway, now under construction, which, from a civil-engineering standpoint, is the most interesting piece of railway work undertaken during the year. This line will ascend to the summit of the famous Jungfrau, nearly 14,000 feet above sea level, mainly by means of trolley wires and a rack railroad, the last 240 feet, however, being vertical, by means of an elevator. The road, when completed, will be 7.9 miles long, 6.7 miles of which will be through tunnels blasted from the solid rock. About 1.2 miles is now in operation.

Combined Alternating and Direct-current Roads.—The principal example of an electric road operating from three-phase currents with a storage-battery auxiliary is that of the Buffalo Street Railway company, which operates 300 cars, deriving its energy from the Niagara Falls Power company over a three-phase line of 25 cycles per second, and converting through rotary converters, whose direct-current ends operate in parallel with the battery auxiliary.

Among interurban roads, one of the principal examples in this country is that of the Barre-Montpelier (Vt.) Traction company, which generates its current by water power at 2,200 volts, steps up to 6,300 volts, transmits eight miles to a sub-station, and then converts to 480 volts. It is then passed through rotary converters, the direct-current end of which operates in parallel with storage-battery auxiliary, and feeds the current out to the nine miles of trolley line, operating five cars with a direct-current trolley pressure of 550 volts. Another example is that of the Chicago-Milwaukee electric railway, a road projected to run between Chicago and Milwaukee, but which has been operating since July 1st 17½ miles of track between Waukegan and Highland Park, Ill. The power station is located at present near one end of the line, and generates its energy at 5,500 volts, three-phase, and transmits direct from generator to the sub-station, eight miles distant, where it is stepped down by means of static transformers and rotary converters, and drives the trolley line with the direct-current end of the rotary converter at 600 volts. It is the ultimate intention to install batteries in the present and future sub-stations and also in the power station, as the road is extended.

Recent Developments.—Interesting experiments have been made during the year on the Western railway of France with the most recent type of the Heilmann locomotive, but at the present time it is reported that this locomotive is out of service, but whether it is on account of failure to meet the expectations of its projectors, or for other reasons, is not stated.

The Paris, Lyons and Mediterranean Railway company has also been experimenting with an electric locomotive which was supplied with energy from an auxiliary car carrying storage batteries, but the results have not been published.

A recently published report of a committee of French railway engineers appointed to visit this country to determine the status of the electric railway contained the following sentences: "While we

are losing our time on the Heilmann locomotive, the Americans are utilizing, with success, the experience gained in exploiting electric tramways in the development of electrical traction in main-line railways, leaving the generating station at home." * * * * "No more can the electric locomotive be looked upon as experimental. Daily work, over many months, has demonstrated its superior tractive power over steam, and its reduced weight for equal power. Improvement, it is true, is still possible, but the electrical locomotive no longer requires inventing. It is there and has come to stay." To this indorsement from disinterested foreigners comes the news, at the close of the year, of one of the leading electrical companies having closed a contract with the Third Avenue Railroad company in New York city for the complete equipment of its system, aggregating something over \$5,000,000. The energy will be generated alternating and three-phase and transmitted to sub-stations in different parts of the city, and distributed as direct current at 550 volts to the underground trolley, similar to the London underground road.

At the close of the year 1898 everything indicates the projection and completion of many electric railways in the year 1899.

Progress in Power Transmission.

By L. L. SUMMERS.

With each succeeding year it becomes more difficult to distinguish between the plants for energy transmission and those for energy distribution, and the arguments as to relative advantages of the various systems have largely become financial, rather than technical. Distance, to all practical intent, has been annihilated and has also become a question of finance.

The possibilities of extremely high voltage have become assured, and where 10,000 volts was used at Niagara 40,000 is successfully used in the West. Nor are extreme precautions taken, even with this voltage; glass insulators are used more frequently than porcelain, and in the mountain climates are entirely successful; bare wire is standard practice, while pins, cross-arms and poles retain the standard forms and dimensions. The bugaboo of induction and the "Frankensteins" of imagination so frequently conjured have been found to have little existence in fact. Long transmissions operating violently fluctuating inductive loads have failed to materialize any of these visions of fancy. In transmissions above 10 miles good practice sanctions transposing the wires, and thus equalizing the inductive effects of one wire upon another; mutual induction is not prevented by this means, but simply equalized, and the balance of circuits maintained.

For pure transmission the three-phase system has become almost the accepted standard, the distribution being by three-phase, by two-phase or by direct current.

Distribution is the most mooted question in connection with energy transmission. The ever-decreasing cost of power, due to increased efficiency of steam apparatus, the development of the gas engine and the advent of various hot-air engines, has made economies in local distribution necessary. Large amounts of energy, even for short distances, require either high voltage or a large amount of copper, and the tendency toward the high-voltage distribution, with numerous transformer sub-stations, is becoming more and more pronounced.

The large central lighting station no longer inclines to only low-voltage direct distribution; nor does the street railway necessarily adopt the large feeder and standard voltage. Both tend toward transmission and transformers as auxiliaries. The economies in power production have not, on the whole, diminished the possibilities of power transmission, for every economy thus made makes the central-station distribution more profitable.

Distribution determines the selection of the power transmission apparatus and the frequency to be adopted, as the type of apparatus is dependent upon it. A pronounced tendency exists for apparatus capable of meeting the requirements of lighting and power from one machine, that the station may contain but one type of generator. The low-frequency apparatus had advantages for power purposes but was handicapped for lighting. The rotary transformer is now made so that satisfactory service can be obtained on from 40 to 60 cycles, and as this is quite satisfactory for lighting, it is probable that the majority of plants will fall within this range. That lower frequency is desirable for purely power purposes and for the best service from rotaries is generally admitted, so that for power purposes simply it is probable that 25 to 40 cycles will be used.

The production of high voltage directly in the generator, instead of using "step-up" transformers, is meeting with much success, and 10,000 to 12,000 volts is being thus generated. Motors of large size are being used directly on this pressure.

Aluminum wire promises to become a competitor of copper for transmission purposes. At a price of 28 to 30 cents per pound aluminum is equivalent to copper at 14 cents per pound. Aluminum wire has a conductivity of about 60 to 65 per cent. that of copper; its specific gravity is, however, only 33 per cent. that of copper, and a wire of aluminum, therefore, requires 55 to 60 per cent. more area than one of copper to provide equivalent conductivity, and for this con-

ductivity will weigh approximately 50 per cent. of the weight of the copper. Approximately, therefore, at double the cost per pound aluminum will compete with copper. The tensile strength of aluminum is about the same as that of copper, but as the area of the wire used is 60 per cent. greater, the total tensile strength of the line is increased to that extent, but in addition to this the weight of the wire is one-half that of copper, and in any given span of wire, for the same sag, the pull at the end of the span or the point of support is directly proportional to the weight, so that for ordinary conditions the strength of the aluminum line is three times that of the copper for the same conductivity and the same cost. The difficulties of procuring aluminum as easily as copper may necessitate carrying a larger stock in the storehouse. Aluminum cannot be soldered in practice, and it has not been demonstrated as yet that its conductivity will run as regular as copper. As there is no saving in cost, its advantages are entirely those of greater tensile strength. It is questionable whether any well-constructed line can be wrecked by the force of the wind alone, but the aluminum would expose greater surface, and, having less weight, would vibrate more for any given amount of sag in the spans. This might necessitate drawing the spans tighter and thus diminish the factor of strength. Sleet and ice forming on the wires and then vibrating cause the greatest number of wrecks. Pole lines often have a heavy side component thus engendered sufficient to wreck them. Spans of wire which would ordinarily show a pull of 100 to 125 pounds have had this increased to 300 to 350 pounds from accumulations of sleet. A very important point would be whether sleet formation is the same for all sizes of wire, or whether a larger wire will accumulate more sleet. With this feature it might be possible to show that under the conditions which would really try a line to its limit of strength aluminum would have no advantage. Under power-transmission conditions the advantages of aluminum are questionable at any rate, for the pole line is seldom heavily loaded, and with the higher voltages the wires are tending toward smaller sizes rather than larger. It is important that the wires be strung as closely together as safety will permit, as the inductive drop is thus lowered, and under these circumstances there would probably be a very slight factor of strength in favor of aluminum, as the wire would be drawn tight enough to prevent liability of a swinging cross. The conclusion seems to be, then, that while aluminum may have equal advantages with copper, it ought to be sold at a lower figure in order to have any real superiority.

The question of high-voltage switches and the features of lighting protection have received a large amount of attention, and though no standard can be said to have been adopted, there are but two or three types which are extensively used. The oil and pneumatic switches have been adopted in large eastern plants, while in the West the switch commonly known as the "stick switch" is most used. The latter device is simply a wooden stick with a contact-making device at the end, connected by a flexible cable; when thrown open the break is quick, and extends over a range of several feet. It has been used on 40,000 volts.

Upon the whole the year's development has been most satisfactory and has been of a steady growth, rather than in any startling innovations or improvements. That power transmission is a financial success as well as a technical success is equally certain.

The Telephone in 1898.

By ANGUS S. HIBBARD.

Perhaps no department of general public service responds more quickly to business conditions than the telephone. This fact has been more emphatically demonstrated during the year 1898 than ever before. The growth in number of telephones operated in exchanges throughout the country has been unprecedented, and the increased use of telephones installed has been equally remarkable.

New York continues at the head of the list of American exchanges in the number of telephones, over 25,000 now being operated in that city. In Chicago the total number has increased to nearly 18,000, and, as in previous years, the number of messages is greater than in any other one city.

The automatic-signaling central-office apparatus, plans for which were developed in 1897, has proved a great success and has been introduced in many large exchanges, notably in New York, Chicago, Boston, Cleveland, Louisville, Indianapolis, Worcester and other points. The coming year will see a greatly extended use of these appliances, by means of which more perfect telephone service is being given than on any previous plan. These new exchanges are operated entirely from power and battery plants located at the central office, and the plants of motors, dynamos, batteries and controlling apparatus have been greatly perfected.

The general increase in business in all branches has demonstrated to the busy man in all departments of work that the best kind of a telephone is a most valuable aid to his transactions. The number of telephones placed on desks of busy men has increased by thousands. Private branch exchanges, by means of which various departments and officials of firms or corporations may not only talk with each other, but with the general telephone exchange or over long-distance lines, have greatly multiplied in number. Time to the busy man has become valuable, and the

telephone is, first of all, a time-saver. The domestic use of the telephone has increased very greatly, and its use in private residences is constantly extending.

The use of the long-distance and toll-line systems has increased greatly during the year. Important extensions of the long-distance lines have been made throughout the West and South, and almost every city and town east of the Missouri River is now reached by these lines. The result is that very many transactions, which formerly required a trip to the distant point at a large expense and consequent loss of time, are now completed by a five or 10 minutes' use of the long-distance telephone, and the trip is thus avoided.

The improvement in general business conditions is shown in an interesting manner in the records of the calls handled by the Chicago telephone exchange. A year ago a total of 220,000 daily calls was reached. At the present time this has been increased to 270,000 calls. One firm alone in Chicago, in one of its offices, is handling in connection with the Chicago exchange a total of about 2,200 calls daily. The methods of even five years ago would have been unequal to the demands of such service, but it is gratifying to know that the improvements made in the field of telephone engineering year by year have not only kept up with the demands, but are in advance of the present requirements.

The Use of the Storage Battery.

By FRANK H. CLARK.

A retrospect of the year 1898 discloses no important developments in storage-battery design or manufacture. Nor can it be said that any novel applications of storage batteries have been projected. At the same time the storage-battery business of this country has nearly doubled during the year just closed and many important installations have been made. Among these may be mentioned the battery of the Chicago Edison company, the largest single battery in the world; the Buffalo Railway company's battery, until recently the largest railway regulating battery; the two batteries of the South Side Elevated Railroad company, which have attracted so much attention by reason of their large size and the simplicity of method of installation, and the two enormous batteries now being completed for the Metropolitan Street Railway company of New York. The batteries for the Metropolitan company have a combined capacity of 9,000 kilowatt-hours.

Within the past year several large companies have added to their storage-battery capacity, one large street-railway company having installed its third battery, while a prominent lighting company has installed three large batteries in the last six months.

The development of the horseless carriage during the last year has not been as great in this country as in Europe. At the same time these vehicles have ceased to be a novelty and no longer attract attention in large cities. In the beginning it was thought that the limitations of weight and durability of the battery were the only problems to overcome in operating automobiles by storage batteries. Experience has demonstrated, however, that batteries of standard weight and capacity readily meet the requirements of cab or carriage service in cities, as they are able to make from 25 to 35 miles of service with one charge. On the other hand, great difficulty has been encountered in determining the proper ratio of gearing, the best method of steering, the best form of wheel and the most suitable tire. These problems are being successfully met and there can be no longer a doubt as to the future of the horseless carriage.

It is reported that a recently organized company has purchased the Fifth Avenue stage line in New York city and proposes to substitute for the present stages drawn by horses omnibuses operated by storage batteries. There can be but little doubt of the ultimate success of this project and that the current year will see similar lines established in all large cities where they are not precluded by too steep grades.

A very large and increasing demand for storage batteries comes from the telephone companies. The batteries are deemed necessary adjuncts of central telephone stations. Dynamos with storage-battery auxiliaries are rapidly superseding other methods of operation in large central telephone plants. This centralization of power and operating mechanism allows of the greatest economy as well as greater reliability of service. By taking up the fluctuations the battery enables the dynamo to furnish a steady current. The battery is also used to take care of the peaks of the load, and to carry the entire load at night, when the demand for current is light.

The current year will probably witness the installation of several large storage batteries in connection with plants obtaining current from water-power companies, where the maximum power to be had is insufficient to care for the peaks of the load, or where the water-power company's charges for current are based upon the maximum used. In either case a battery or steam auxiliary is a necessity, and where the peak is of short duration the battery is preferable, by reason of requiring a minimum of attendance and no fuel.

Train lighting by electricity is becoming more and more popular, and every new train which is put in service is either equipped with dynamos and engine or storage batteries or both. Railway men object to the method first named because of the

draw on the locomotive in cold weather, the attendance required while en route, and the fact that the lights go out when the engine is changed. It would seem, therefore, that the method to be desired is one where each car carries its own source of light. This can be secured by batteries, which may be charged at termini, or by a combination of dynamo and batteries in each car for runs of 24 hours or less. The former method will give excellent service at small cost.

There is every prospect that the current year will be marked by greater commercial prosperity than any previous year. If so, it is fair to assume that the storage-battery business will at least keep pace with kindred industries.

Isolated Light and Power Plants.

By R. H. PIERCE.

It is a difficult task for one to make a fair statement of what has been done in isolated work during the year unless he has devoted considerable time and energy to the collection of data for that express purpose. It has already been noted by writers who have attempted to make statements concerning the amount of apparatus sold or lights and horse power installed that the manufacturers exhibit no anxiety to make a showing of just what they have done. A search through the electrical journals does not by any means show all that has been done. Only a few of the more important isolated plants installed during the last year have been described.

The technical journals have to depend very largely upon information received from the manufacturers and engineers, and it is practically impossible for the journals to give a complete record of what is done in that line, as the manufacturers are not willing to publish a list of customers and tell everything they are doing in some particular line of work, and it is only when they have some new system or apparatus which they are anxious to advertise that they will take the trouble to give the technical journals complete data. Again, the engineers, as a rule, will only take the trouble to give complete information concerning plants which they have designed when they have some specific object in having such a plant described.

The most that we can do, therefore, in a short article like this, is to call attention in a general way to what has come under our direct notice or has appeared of sufficient importance to warrant its being described in a technical journal.

A considerable portion of the isolated business of the past year seems to have consisted of equipping existing buildings. There has, however, been quite a number of large important plants installed in office and public buildings. The work done in these lines has been sufficient to show that the isolated-plant lighting is holding its own. In 1898, as in past years, the problem of heating has been the main factor in determining the use of isolated plants in this class of buildings. The same state of affairs will continue to exist until heat as well as light and power can be cheaply distributed from central stations.

Referring to particular appliances, the enclosed arc lamp has been extensively introduced, and we may say that it is now practically the standard for isolated plants. The fact that the enclosed lamp needs to be seldom trimmed is appreciated by owners of isolated plants, and the distribution of light from these lamps is such as is usually required for inside lighting. The 220-volt incandescent lamp has become more widely known. Many 220-volt lamps have been used in connection with 220-volt power transmission. There appears to be an increasing field for their use, as many of the factory transmission plants and plants supplying power to a number of adjacent or neighboring buildings come within a distance that calls for 220-volt motors. On the other hand, the expectations of many people that the 220-volt lamp would be extensively used for lighting plants does not seem to have been fulfilled, and we incline to the belief that when the use of the three-wire system is open to the public, as it will be in the near future, the use of the 220-volt lamp will be limited to special cases, the particular case where it will be most used being when the lighting is the smaller and the motors the larger portion of the load on the plant. The tendency in isolated lighting plants, as well as in central-station practice, is always toward economy, and in good-sized installations for lighting the saving by using a three-watt, 110-volt, instead of a four-watt, 220-volt, lamp will usually more than justify any additional complication or expense involved.

The typical new isolated plant of 1898 shows a decided tendency toward the installation of plants that are economical in the production and consumption of steam, as well as efficient electrically. In the large cities a high grade of construction has prevailed.

The introduction of the enameled iron conduit has helped to cheapen good construction, and we are now promised a practically flexible steel conduit, which, if it does not cheapen, will certainly raise the standard of certain kinds of interior construction. The underwriters' list of approved fittings has been of great assistance to architects and engineers, helping them to insist upon better appliances and probably resulting in better work in the large cities. We hope that its influence has penetrated the rural districts, but we doubt if it has affected them very much. There has been on foot an earnest move-

ment on the part of the underwriters to insist upon the use of better insulated wires. Thus far their efforts have produced little effect, at least in the manner desired, but we are promised action in the near future which, it is hoped, will help toward bringing about this much-desired result.

The branch of isolated work which has proved the most interesting and probably the most active in the past year has been the installation of plants for short-distance transmission, especially for manufacturing plants. Motor manufacturers all report a good business, and the electrical equipment of factories has become such a regulation thing that the installation of many large and important plants has received only a passing notice in electrical journals. The coming year promises to be equally active in this same line. Plans and estimates are now being made for a number of very large and important transmission plants for factories, packing-houses, etc.

Most of these transmission plants have in the last year used low-voltage direct-current motors, but we have noted during the last year the installation of quite a number of low-voltage alternating-current systems for factories and manufacturing plants where motors have all been located within an area of a block, or, in some cases, where the distances have been very short. Some manufacturers are now pushing the introduction of alternating-current motors for power-transmission plants, practically regardless of the distance, claiming superiority for their alternating-current motors. The special claims which they make for these motors are efficiency, large starting torque and, especially and mainly, the absence of commutators and moving wires. There are undoubtedly cases where alternating current can be used to advantage in short-distance power transmission, as, for example, where there is a large amount of lighting so distributed as to call for alternating-current distribution, and when at the same time it is desirable to use but one type of machinery.

We look for the year 1899 to solve the problem of when alternating-current motors should be used and when not.

There has been a very notable increase in the use of slow-speed motors connected to driving shafts or direct-connected and the consequent discarding of shalting and belts. Slow-speed motors are no longer special, but have become standard machines, and the prices are now such as to lead to their rapidly increasing use.

Perhaps the most encouraging thing that we have noted in the past year is that owners, especially the owners of manufacturing plants, have become prejudiced in favor of, instead of against, electrical transmission. This is undoubtedly due to the fact that they have had a chance to see satisfactory results accomplished. They are all coming to realize that it is not simply a question of how much is lost in the dynamo, wires and motors, but how much is lost between the coal pile and the driven machine. Looking at the problem in this way, they are finding out that in a properly designed plant, using electrical transmission, the machines can be operated with sufficiently less expenditure for fuel to justify any additional investment that may be called for, and, at the same time, they very often find that their machines will turn out better work and will run more hours in the year. It appears that at last a properly designed plant for heating, lighting and distributing power has come to be considered a necessity in manufacturing plants as well as in most important public and semi-public buildings.

Ten Months' Electrical Exports.

By A. F. TENNILLE.

The electrical exports of the United States are steadily increasing. During the first 10 months of 1898 we supplied telegraph, telephones and "other electrical equipment" to the world at large to the extent of \$2,224,664; during the corresponding period of 1897 the value increased to \$2,623,944; and while during the present year the increase has not been quite so marked, still the value was \$2,628,002, and the increase in value is largely to be attributed to the more liberal conditions that have existed in several foreign markets by reason of our late war in Cuba. Thus, for instance, the exportations to the Central American states and British Honduras, which last year were from \$71,627 last year to \$165,552 this year. In the West Indies and Bermuda the exports were more marked—from \$162,470 to \$277,736.

The following table is a report of this class for the ten months of the year 1898, and is as follows:

Ten months ending October 31st.		
	1897.	1898.
Total	\$2,623,944	\$2,224,664
Telegraph	1,172,272	1,172,272
Telephone	1,172,272	1,172,272
Other electrical equipment	279,400	279,400
Central America and British Honduras	71,627	165,552
West Indies and Bermuda	162,470	277,736
Other foreign countries	1,718,775	1,718,775
Canada	1,172,272	1,172,272
Europe	1,172,272	1,172,272
Asia	1,172,272	1,172,272
Africa	1,172,272	1,172,272
Australia	1,172,272	1,172,272
South America	1,172,272	1,172,272
Other	1,172,272	1,172,272

countries showing a decrease are those classified as "Other Europe," Canada, Central America, West Indies, Brazil, "Other South America" and Africa; and perhaps the most noteworthy increase in value during the time specified has been that of the exportations to China, which has been four-fold during the 10 months.

Prior to July, 1897, no separate account was kept of the exportations of electrical machinery from this country. Between that time and the end of October the value was \$489,913, or an average of \$163,304 a month. During the 10 months of 1898 the total value of these exportations is given at \$1,939,474, an average of \$193,947 a month, which is an average gain of \$30,000 a month. The European markets should present a profitable market for all electrical equipment. After years of standstill there is a general awakening all over Europe to the value of American-made electrical equipment, and electric street railways, electric-light plants and telephone stations are springing into existence month by month.

The Telegraph in 1898.

[To cover the telegraph field two brief articles are given, the first by Mr. E. J. Nally, assistant general superintendent of the Postal Telegraph-cable company, and the second by an officer of the Western Union Telegraph company.]

The year just closed has been an eventful one for the telegraph companies. The first half marked the beginning and practical finish of the Spanish-American war, which caused a greatly augmented business, especially in "press" or newspaper reports. The last half, particularly the closing months, was notable as having produced the most destructively severe storms from a telegraph standpoint that had ever been experienced; first, wind-storms of great severity, followed later by wet snow, unusually early and extraordinarily heavy for the latitudes visited; then sleet-storm after sleet-storm, causing the copper wires to break in thousands of places, interrupting communication and entailing very heavy expenses for repairs and renewals, not to mention the resulting loss of business.

It can be safely said that the telegraph business is the barometer of general business. The war somewhat disturbed general business, helping some lines and interfering with others. Usually the receipts of the telegraph companies show a gradual and steady increase, beginning with May of each year, and continuing each month until the business reaches its greatest height in October; then a gradual and steady decline sets in, until the lowest is reached in January and February. In 1898, however, May and June showed the greatest traffic; July and August greater than the same months of the preceding year, but less than May and June. September was steady, with October, November and December very good.

Taken as a whole, the press associations and newspapers are among the best patrons of the telegraph, and the late war afforded them an opportunity to show the public that they were bountifully generous and enterprising to a great degree in their efforts to secure the news for their readers. They gave carte blanche to their many correspondents in the matter of descriptive filings. One Chicago paper gave its Manila correspondent an order to file 10,000 words, or more, of Dewey's great victory—quite an order when one knows that the press-rate on cable dispatches from Manila is 58 cents a word, which, by the way, is not too much, when one considers the many thousands of miles of submarine cables and land lines necessary to make up such a circuit, involving, as it does, not less than seventeen manual relays.

Another Chicago paper shared in an expense of many thousand dollars for a single dispatch of the Manila battle.

No country in the world has such able, enterprising newspapers as ours, and no city in this country is better represented in this respect than Chicago.

The Postal Telegraph-cable company made large additions to its mileage of poles and wires during 1898. It built three routes into Texas—one from St. Louis, one from New Orleans, and one from Albuquerque. Nearly every city of importance in the state of Texas was connected with the postal system, and extensions will continue until every place of commercial importance in that state is included.

Many important extensions are planned for the new year, and the boast that "Our record shows that every time the sun rises a new Postal telegraph office is open to the public" will be fulfilled.

The war with Spain caused a large increase in the number of press dispatches and government messages handled by the Western Union Telegraph company in 1898.

The telegraph was an important factor in aiding the government to move troops, battleships, etc. This being a country of magnificent distances, the telegraph had to be employed almost exclusively by the War Department at Washington. The following figure will give the reader an idea of the important part the Western Union Telegraph company played in the prompt handling of the War Department's business from the time war was anticipated until the close of hostilities.

From May 1st until December 31st about 209,000 telegrams were exchanged between the War Department office and other offices in the United States. The Western Union company detailed 20 telegraphers to the War Department office, which was open for business at all hours. The number of press dispatches were correspondingly large, and a large extra force of telegraphers was employed to handle the

increased business, which was promptly transmitted.

The company's report for the year ended June 30, 1898, shows an increase of 33,418 miles of wire and of 441 offices. The number of messages transmitted was 4,022,065 more than for the preceding year. The revenues for the year were \$1,276,873.62 more than for the preceding year. The increased revenues made necessary an increased outlay for operating and general expenses of \$655,111.63. For reconstruction and maintenance, to preserve the efficiency of the property, \$342,913.91 more was spent than for the preceding year, and the cost of equipment of the new offices and for improving old equipments was increased \$48,371.51.

The average tolls received were 30.1 cents per message. The average cost per message was 24.7 cents. The decrease in the average tolls received, and the increase in the average cost per message, are accounted for by the large number of government and press messages, consequent upon the war with Spain, transmitted during the latter part of the fiscal year, on both of which classes of messages the tolls are the lowest, although the highest grade of operating service has to be employed for their efficient transmission.

The cost of construction of new property for the year was \$1,117,651.61. The surplus account was increased \$315,694.06.

During the year the Western Union company transmitted 62,173,749 messages, receiving therefor \$23,915,732.78. The profits were \$6,090,151.26. The number of offices on July 1st was 22,210, and the number of miles of wire, 874,420.

The Progress of Central Stations.

By LOUIS A. FERGUSON.

The development by central stations during the last year, although showing nothing which might be considered startling, has been of a decidedly healthy character and sound in tone.

From the engineering side we have witnessed the practical operation of some of the apparently radical theories and suggestions of the last few years and have gained a better and more perfect knowledge of their characteristics. We have improved many of the details of the apparatus, and have developed, almost to completion, the systems which a year ago were, even to those best acquainted with their possibilities, somewhat embryotic.

The demand during the year by central stations for apparatus which combines in a system the advantages of the alternating and direct current has been almost as remarkable as the recent bull movement in stocks of consolidated industrials on the stock exchanges of New York and Chicago.

The rotary transformer is now becoming an addition to the electrical distribution system in every large city and is being used for a great variety of purposes. Its record during the past year has assured to it a permanent place in the sub-station, employed either to feed the distribution system directly or to charge a storage battery or both. It is operated successfully in parallel not only with others of its own type but also with dynamos driven from engines in the sub-station. In railway work the rotary has a great future, and many plans have been made during the year by engineers in this country and in Europe in which the rotary will play an important part in the operation of railways. One notable example is the case of the Central London underground railway, where rotary transformers will be employed in a system designed by the American engineer, Mr. Horace F. Parshall.

The combination generator was last spring put into successful operation in the system of the Chicago Edison company, furnishing coincidentally direct current to the main bus bar in Harrison street station and three-phase alternating current to the transmission line to the company's sub-station 3½ miles distant, where it delivers energy to rotary-current transformers.

The field of usefulness for this type of generator is very wide, and in many cities it may form an exceedingly important factor in the companies' equipment.

Notwithstanding the increased use of the rotary-transformer system by central-station lighting companies, the storage battery, which at one time was severely threatened by the introduction of the former, has made rapid progress, and its value is being more generally appreciated and confidence in its stability more assured. The advantage of the battery for peak work, when properly applied, is at once apparent to a student of central-station conditions. The storage battery has proved its value when employed at the central distributing point of the lighting or power system, with feeders radiating to various points in the network of conductors. When so located the battery is provided with two or more end-cell switches, so arranged that they may be connected in multiple and feed into the main distributing feeder bus, or they may connect also to one or more auxiliary bus bars, with a different number of cells in series feeding into each bus, thus providing two or more potentials at the center of distribution. The battery when so arranged becomes exceedingly valuable, the long feeders being connected at the time of maximum load to the auxiliary bus bars and additional current forced over them, utilizing their full capacity and maintaining a uniform feeder-end pressure by means of an investment in end cells which is very slight when compared with the investment in addi-

tional feeders and mains required to accomplish the same result.

There is one improvement which is warmly cherished by all central-station managers, and it is that effected in the uniformity of manufacture of the incandescent lamp. The work which has been done by the Testing Bureau of the Association of Edison Illuminating Companies to aid in the accomplishment of this most decided improvement, both in the uniformity of the lamps and the maintenance of candle power during their life, is very creditable indeed, and the public, as well as the central-station companies, is naturally benefited thereby.

Those who were fortunate enough to be present at the September meeting of the Association of Edison Illuminating Companies at Sault Ste. Marie and listened to the paper by Mr. Wilson S. Howell on the work of the Lamp Testing Bureau during the year, enjoyed a scientific treat, abounding in most interesting diagrams and figures, and demonstrating most ingeniously the marvelous state of perfection which has been attained in the manufacture of incandescent lamps for the Edison central stations.

The improvement in constant-potential arc lamps has advanced materially during the year, and this is especially so in the case of the enclosed lamp for alternating currents. The open arc lamp for constant-potential circuits has practically disappeared from the market, and has been entirely superseded by the enclosed arc lamp, since it may easily be determined that the saving in carbons and trimming in the enclosed arc lamp will, in two to three years of average burning, pay for the entire cost of the change by the central-station company.

It is thought by many that the series arc dynamo will gradually disappear from the central station and that the large central stations will operate their arc lamps in series from regulating transformers connected to the alternating-current bus bars of the future central station and in some cases employing rectifiers. Such a system has many of the characteristics of the ideal, and its progress will be watched with interest by all those who operate alternating-current machinery.

The use of the synchronous motor for driving arc machines in central stations has been carried forward to a considerable degree, not only in substations remote from the main generating station, but, in one case, the synchronous motors have even been installed in the same station with the main alternating generators. In other large stations about reaching completion we find the series arc machines retained, but driven by rope from the main engine, to which is directly coupled the generators either for railway or lighting work. There is a marked diversity of opinion as to which is the best of these various methods, but to determine it one should consider the prevailing character of the output and all of the conditions surrounding the company's operation.

Moto-cycles are daily becoming more prevalent throughout the streets of the large cities, and in London and Paris they are exceedingly popular. Their more extended use will constitute an outlet for the central-station companies' product, and we may expect in the near future to find at convenient points throughout all of the large cities of America charging stations for the moto-cycle, where the weary battery may, through the medium of the slot-machine meter, be refreshed and prepared for a continuance of its journey.

A great interest has been shown in all of the discussions relating to the questions of rates and methods of charging, and much good has been derived thereby in the more intelligent understanding by the central-station managers of the principles underlying the cost of production of electrical energy and the conditions which should govern the determination of its selling price.

The point had been clearly brought out that fixed costs, as distinct from running costs, form the greater percentage of the total cost of a unit of electrical energy, and that any method of charging to be equitable should be one which takes into consideration the average number of hours' daily use of the company's investment by the consumer.

During the last year many of the central-station companies have adopted for all their new business the Wright demand system in an Americanized form, and the practical success and popularity of the system has been clearly demonstrated, resulting not only in reduced cost to the small consumer who uses the company's investment many hours daily, but at the same time materially increasing the earnings of the company through the more extended use of its product.

The tendency toward merging of capital and consolidation and concentration of plants, which has been so marked this year in many industrial lines, has extended also to the central-station lighting and power business. It is a natural sequence and should ultimately result in great good for the community if the consolidated properties are controlled and operated by conservative and representative men. A distinct advantage to the public is gained by consolidation, through the standardizing of the systems of electrical distribution in the cities, which should follow to a large extent, at least in sections, as the stations of the various companies are concentrated and their distribution systems merged.

The Independent Telephone Movement.

By H. D. CRITCHFIELD.

Statistical statements, accurate and full, of the development and growth of what those who are most interested in it term "the independent telephone movement," during the year just closed, cannot be given. Those who are associated with the more than 2,000 corporations in the United States—a very large proportion of which are in actual, tangible existence and successful operation—have not as yet seen, as it would seem they should, the advantage of thorough organization and of mutual reports on lines that would provide such statistics, so they could not well be obtained. But, from the standpoint of one frankly confessing identification with the independents, there are salient facts as to the progress of the independents in 1898 which merit consideration.

While there was great and unparalleled growth among the vast majority of the older, well-established, independent exchanges, and as to their toll-line connections, during the 12 months, to those most watchful of the field the most significant and gratifying progress assumed another form—the rapid development of interest and effort in circles controlling large capital, and organizing to afford service in the largest cities of the country. In the earlier stages of the independent movement it was confined to smaller towns and hamlets, to communities whose outside interests were limited, and which therefore had but little need of and use for "long-distance" service. For example, in the state of Ohio, there were a number of towns where the Bell company had never given more than a toll-line service with from one to half a dozen telephones, that conceived they could use independent exchanges at popular prices. Local capital built such exchanges and established rates that secured remarkable patronage, with satisfying returns for those who "adventured their cash."

The telephone user is distinctly and distinctively a gregarious being. Soon the smaller exchanges began to reach out their toll-line tentacles to post-offices and cross-roads in their nearer vicinity, then to reach toward each other for an interchange of business, and at last to clamor at the doors of the larger cities with which they had business relations for independent exchanges and the resulting better and cheaper connections with such jobbing and manufacturing centers. But right here for some time there was hesitation or actual stagnation of the independent movement. Capital in large sums was conservative or timid. It might attract an attention and arouse a competitive war that would prove seriously disagreeable or destructive from interests that had paid little or no heed to smaller and, relatively, unimportant concerns. And so, though there is now a goodly number of independent exchanges in continued and highly successful operation in portions of the United States that are more than four years old—notably in the Middle West—before 1898 one could count on one's fingers—one hand at that—all the plants built, then building, or even seriously mooted by competent companies in cities of upward of 50,000 population.

As to this, the end of the year witnesses a change that is indeed marvelous. In this the progress of 1898 has been pleasing beyond the most sanguine expectations—one might almost say, hopes—of the pioneers in the larger independent companies, or of members and officers of the several state associations or of the national independent organization.

A resume of this would be most interesting and instructive could it be made complete, but so rapid has been the recent growth, even the most careful and observant gleaners of the news in this field could scarcely hope to keep accurate files of the facts. As notable an example as can be given is the signing, but a few days since, by Mayor Quincy, of an ordinance for a competing telephone company organized in the very home, in the supposed citadel, of the Bell company, in Boston! In Worcester and other Massachusetts towns, where the very best results the old company could produce were offered patrons from newly built, up-to-date exchanges, the people are taking hold of the new companies with enthusiasm, energy and cash. No longer are independent exchanges with 2,000 or more telephones declared by their competitors to be an impossibility as a practical proposition. They do work, and several more, involving hundreds of thousands of dollars, furnished by the most sagacious and successful business men in their respective localities, are now building, and still more were completely organized during this most memorable year of the independent telephone development, and will be in operation before the twentieth century shall arrive.

When the president of the New York Board of Trade and Transportation and his business associates, and men of like standing and prominence in other great cities, seriously discuss, and even enter upon the independent movement for their local advantage, they couple with it a legitimate and ample plan for long-distance lines and connections. There are at least three companies, with a million of capital each, in this field of endeavor, which made such progress last year, in both plans and construction, as delighted the independents and almost dazed the other fellows. This year will see these and other companies putting up and into use thousands of miles of first-class, full-copper metallic trunk and

toll lines, the equal of the very best ever seen in this or any country. The state of Ohio, Indiana, Illinois, Michigan, Pennsylvania—all the states, indeed, from Maine to California, from Texas to Minnesota—seem likely to enjoy a boom in this development, the carrying into execution of the plans and preliminary labors of 1898.

It seems to an independent that perhaps the second great factor of progress to be recorded for 1898 consists of the changes and development as to character and quality of the independent plants and service. Earlier in the movement many—nearly all, as it would seem, now, from a hasty backward glance—appeared to think that anything that would "talk" for a short time would suffice; a couple of tin cans connected by taut twine made quite a telephone plant; that sort of thing, at popular prices, was "better than going about," "a heap better than nothing," and though faulty and soon entirely inadequate, developed a sturdy appetite for something better, more permanent and certain of service. This better service was essential for larger cities with bigger exchanges and busier switchboards. In some instances the necessities of this situation were considered quite discouraging in the earlier months of the year, but good examples proved both infectious and contagious. The manufacturers of apparatus realized their duty, nearly all of them, and promptly began to act upon the theory "not how cheap, but how good, a system can we produce." Inventive and mechanical ability made giant strides in the production of apparatus, and systems are now building, and certainly to be built, with a thoroughness and attention to detail and results not excelled by any other like enterprises in America or in the world. Indeed, the independents have shown a consideration for the respective cities where such work has begun, in underground construction and other respects, never before exhibited in American cities. While in this matter the development of 1898 is great and splendid, evidently this year and the years to come are to make still more marked changes; both business and money are at the command of the independents.

To some, from the selfish standpoint, the next feature of the movement is the clearing of the patent situation. There were quite a number of notable legal victories which the Bell company did not win last year. The writer does not recall a single decision in 1898 of the slightest encouragement or value to the Western Electric company or the American Bell Telephone company, in the telephone field, with the possible—and highly dubious—exception of the Carty case. And when threatened litigation ceased to be a bugaboo with which to frighten and deter capital, the disposition to resort to it seemed to materially decrease. The beginning of new suits has not been often reported the last year, and well-versed lawyers, whose counsel is sought and valued by men of large business experience and means, while urging the full and wise use of all legal defenses upon occasion, no longer look doubtful when the name of Berliner and his notorious patent are mentioned.

A single suggestion, scarcely more, can be made of the fourth factor in this progress, that is, the growth in invention, the improvements in appliances and methods of using them. The Patent Office Gazette's weekly reports have shown increasing activity in the telephone department, which already shows many thousands of patents of more or less value. It may be mentioned that since the inventor is no longer confined to a single market, which is absolute dictator of the terms of possible purchase, the hope of greater reward has proved a wonderful stimulus. There are indications that many bright, useful ideas which have been quietly brooding in the brains, or hidden in secret, locked laboratories and workshops of men who within the last year or two have changed employers and professional relations, are at last to be practically developed, and to begin to benefit their authors and mankind.

Not least, after all, though last in the category of progress in 1898, is the public realization of the true situation, the scope and possibilities as well as the purpose of the independent movement, and the wisdom, the necessity, for thoroughly maintaining and sustaining it. This might be deemed a difficult as well as delicate phase of the topic, but, after recalling the frank confession at the outset of the point of view of this review, it may well be mentioned. There is no longer any doubt as to the people, the very intrepid exceptions but accent and emphasize the rule. Where they are fairly treated by the independents, where they are dealing with their neighbors and friends, which is almost invariably the case, and are given fair service, tending to betterment, at reasonable prices, they have repeatedly, time and again, demonstrated their attitude and convictions. Rumor, competition, even free service, and all sorts of subtle seductions, offered in various guises, do not deceive or beguile them. They do not "use self" of the main facts and issue, nor of their duty to themselves and their fellow citizens. In this respect the education of the last year has been more instructive and important in influences and effects than all the years of competition in telephony preceding it.

While there are tens of thousands more of telephones, and better, in use now than in 1897, with thousands of miles more, and better, of toll-line connections, and an increasing growth in the taps for 1899, as a result of the wise planning and

organizing of 1898, still the truest and best measure of the progress in independent telephony in 1898, as it seems to the writer, is along the general lines hastily suggested in the foregoing rather than in statistics, either of corporations or apparatus, though they would tell a tale that would scarcely seem credible to those not familiar with the interest outside their immediate localities. And the coming years promise accelerated growth in almost geometric ratio.

The Moto-vehicle Industry.

By C. E. Woods.

A general review of the moto-vehicle or automobile industry in the United States as pertaining to its development in the past 12 months brings out some very interesting facts, and principal among them, from an industrial point of view, is that the general public has finally awakened to the practicability of the self-propelled vehicle, and is making vigorous inquiry in all directions concerning its application to its wants.

In the meantime, inventors, engineers and mechanics innumerable have been busy with the solution of the problem in their various capacities—some with electric power, some in gasoline, some in compressed air, and so on, through an almost innumerable number of combinations, many of which have proven their practicability in general and in individual ways.

All of Europe has now what is known as the automobile craze, and fashionable people in that country have taken the matter up, and so anxious for vehicles have they become that they are willing to accept any and all kinds, as they are able to obtain them, either perfect or imperfect; and while this condition has not obtained in America, yet the most marked inquiry has come from commercial circles for wagons for the delivering of merchandise, and next for vehicles for public transportation, and at the closing of the year a very marked inquiry indeed is being established from all classes of people concerning vehicles for their own private, individual use, and it is very satisfactory to note that in general these inquiries are coming from a class of people who are users of fine carriages. And it is also very noticeable in this inquiry that the electric vehicle seems to have the preference for such work. This preference, however, is sometimes made without a very clear understanding as to the limitations of the electric vehicle; and in such cases, where they are used through the country, from town to town or for touring and long-distance work, the gasoline wagon has, of course, the preference, because of its partial independence from charging facilities and its accessibility to fuel at nearly all points.

In both classes of vehicles a very great improvement has been made during the last year in simplicity of operation and in durability, as well as in elegance of design, and long tests of the storage battery have demonstrated the fact that a battery properly constructed and with good care and attention is wholly adequate to the demands which will be made upon it for nearly all classes of work. The only possible objection to the electric vehicle is accessibility to charging points, which is at the present moment being taken under advisement by electric-light companies of the larger cities, and steps toward provisions for charging electric vehicles are being taken in the shape of public charging stations at various points throughout the cities. As soon as these are established, there will be no limitations to the electric vehicle in its operation, as batteries to-day can be charged very rapidly, and with public charging plugs to drive up to at various points in the city there is no necessity of ever running out of current.

Aside from the cabs in use in New York city, there has not been a very large number of vehicles put into practical operation—probably not to exceed, including these, four or five hundred throughout the United States, if that many. Some concerns have shipped a few of their vehicles to Europe, and, to the credit of American industry and enterprise, it is to be said that the American products in this line have met with a very favorable reception, and the indications are that the demand for American vehicles will make big encroachments upon those manufactured in Europe. This statement, broad as it seems, is in keeping with exports of all kinds of machinery which are now being made to foreign points.

Twenty thousand carriage makers are required to fill the demand for ordinary vehicles in the United States to-day, of which some twelve or fourteen thousand are good, reputable concerns. This is only cited to show the field which the moto-vehicle industry has to operate in, and with such an extensive field at home and such splendid invitations in the foreign market, there is room for many more manufacturers in this line of work before anything like severe competition in prices is necessary. As a matter of fact, the prices that are being quoted to-day on moto-vehicles, as thoroughly finished, machine productions, will never be reduced to any great extent. Some novelties, a la Paris and the continent, may be brought about which are of course purchased much cheaper than a good carriage can be sold for. Electric vehicles, however, are able to cope with the general market, and, so far as the market

is concerned, neither form of vehicle has any great prestige on this score.

On the whole, both as an industry and as a product, the moto-vehicle has to-day one of the most promising futures of any line of development that has taken place in the last few years.

Electrical Construction and Inspection.

By EDWARD B. ELLICOTT.

During the last year the character of electrical installations has changed for the better in a more decided and noticeable manner than in any previous year. The introduction of new rules of practical and consistent requirements found a large number of contractors ready and anxious to do work in accordance with them. There are comparatively few instances in which it was found impracticable to follow the rules to the letter; the necessary departures did not mean a less safe installation; and I have yet to meet a contractor who was unreasonable in his requests.

Contractors with good intentions and reputations can do more to improve the electrical installations than can be secured from a reasonably close inspection. The utter impossibility of formulating rules covering the details of construction applicable to every building leaves much to the contractor's judgment, and in most instances the responsibility has been well placed and the result creditable. This fact is emphasized by the work of the inspection department in Chicago. More work has been done this year than in any previous year and the cost has been less, admitting a reduction in the inspection fees on two occasions, and making the present cost about 33½ per cent. less than has been charged for many years. City ordinances have been passed regulating the filing of applications and issuing of permits to do electrical work, and have tended to secure better inspection as the work progresses. New rules will soon be adopted in place of those now used, and an effort is being made to secure the most practicable requirements possible.

The electrical installations in Chicago during the last 12 months were about as follows:

Incandescent lights equivalent to 16 candle power each	123,250
Kilowatts, in motors.....	6,386
Kilowatts, in generators.....	5,263
Number of arc lights installed.....	4,337

The most serious problem confronting electrical inspection departments now is the question of proper insulation for wires and the construction of fittings that will pass reasonable inspection and that can be purchased at moderate cost. The majority of new fittings (and there are too many of them) seem to have been constructed on extreme lines—poor design or high cost. A standard list of fittings and wire will simplify electrical installations more than any other departure from the present generally adopted class of work.

BUSINESS SITUATION.

In reply to a number of inquiries addressed to representative electrical manufacturers and dealers by the Western Electrician, asking for a business review of the year just closed, with the prospects for the new year, the appended statements were received. The answers show, generally, a satisfactory state of affairs. The volume of business is uniformly stated to be good, although some manufacturers claim that prices are still too low; others note a distinct advance in prices. The note of business expansion in several of the responses, referring to the island possessions of the United States acquired during the year, will be read with especial interest.

Lakon Company, Elkhart, Ind.: Business with the Lakon company has been very satisfactory during the year.

Carlisle & Finch Company, Cincinnati, O.: The trade in searchlights and projectors was better in 1898 than ever before. The outlook for the future is very encouraging.

Ohio Electric Works, Cleveland, O.: As we see it, the outlook in all branches of the science is incandescent for those prepared to make intelligent use of the art preservative.

Wheeler Reflector Company, Boston: We report an increased volume of business last year over any previous year. In our opinion, there is every indication of a prosperous business ahead in the electrical field.

Perkins Electric Switch Manufacturing Company, Hartford, Conn.: We consider business to be in a much better condition than it has been for several years. The demand for our supplies is better than for some time past, and we have confidence that the business for the coming year is going to be a large one and much better than it has been in recent years.

American Electric Fuse Company, Chicago: In our estimation the electrical trade has been on a gradual increase since 1897. We have found the business of our company has multiplied threefold since December, 1897, up to the present time, and we will further say that the inquiries and the outlook for the future year are more than encouraging. We feel safe in predicting one of the most prosperous

years for 1899. We base our assertion on the inquiries for our electrical devices.

Bigelow Electrical Supply Company, Lincoln, Neb.: We are most interested in city electric-light plants, either municipal or otherwise. Municipal ownership is growing rapidly, and we believe will soon be the accepted view. The year 1898 has been a fairly good year for work in this line, there being more work than any time since 1892. This year we expect even better results.

American Engine Company, Bound Brook, N. J.: We have had a very satisfactory year, and the outlook seems to us to be particularly encouraging. The question of electrical transmission and distribution of power has been attracting considerable attention, and this method seems to be growing in favor. With the abundance of cheap money, the coming year ought to be a phenomenal one in business activity.

Fort Wayne Electric Corporation, Fort Wayne, Ind.: The demands the early portion of the year were unusually good. These were slightly diminished in the early weeks of the war. Since July, however, business has weekly increased. The demand for large arc apparatus to supplement small machines has materially increased during the year. The growing demand for alternating apparatus continues. From the present outlook we feel 1899 will be the best year in the electrical field since the panic.

Electric Appliance Company, Chicago: In the electrical supply business the year which has just closed has been a year of considerable improvement in business, but more particularly a year of promise for the future. It is evident that capital is again seeking investment in electrical enterprises, and with the many disturbing elements of last year disposed of, as it is probable they soon will be, the coming year should be one of large investment in electrical properties and a year of prosperity for all electrical interests.

Kokomo Telephone and Electric Manufacturing Company, Kokomo, Ind.: The Kokomo telephone is making history, but your time is too limited for us to write it. Our business is all right, and we hope as much for others. The prospects were never better with us. 1899 will surely be the banner year for the independent telephone (if the Bell people don't pluck another patent decision on us; but even that doesn't hurt as bad as it did). We have more business before us and more business behind us than ever before.

Baker & Co., Newark, N. J.: We regret our inability to give a very satisfactory account of the growth of the electrical industry during the year 1898. As you know, we confine ourselves to the refining of platinum, and can, therefore, only judge from the consumption of that metal, which has been greater during this year than in any other in our business history, from which we should imagine that the business had been in a very prosperous condition. In a general way, all outlooks point to a prosperous year in 1899.

Delaware Hard Fibre Company, Wilmington, Del.: The outlook, we are glad to say, is exceedingly gratifying. The demand for fiber during the last three months has been unprecedented, and we are running our plant to its full capacity for 24 hours in a day. Along with this increase in business there has been a substantial strengthening of prices, so that, considering everything, we think that the outlook for 1899 is very favorable. The demand for fiber has increased, not only in the electrical line, but in other lines, to an extent which we could not have anticipated several years ago.

Farr Telephone and Construction Supply Company, Chicago: The closing of the year leaves us with an abundance of orders on hand to be filled. For the last three months we have been working our force night and day to keep up with our orders. The outlook for the new year could not be any brighter. The electrical trade in this country is certainly enjoying a great boom throughout the United States and Canada. We are highly pleased with the results of our advertising for the last year in the five electrical journals. We never begrudge the money we pay out for printers' ink.

Electric Railway Equipment Company, Cincinnati, O.: We have been very busy. We have had both our factories running full blast all the year. We have been shipping steel tubular poles, pole brackets and a general line of supplies, such as overhead material, trolley wheels and journal brasses, all over the world. We have just completed a large order for California, and have secured another order of 4,000 poles for Mexico. The business outlook for next year is good, and we think it will be better than it was this past year. We are now building a large addition to our works, which will enable us to furnish goods on shorter notice.

Vindex Electric Company, Chicago: From our experience we are compelled to recognize a general improvement in business over that of the preceding year, and our present inquiries for transformers are such that we are confident that the outlook for the ensuing year for increased business is very favorable indeed. A very gratifying feature of our inquiries is the fact that quality and not price is usually the first consideration. With this encouragement manufacturers are bound to improve the quality of their product, with the result of better satisfaction

to the manufacturer as well as to the purchaser. This is, we take it, a certain indication that business is generally in a more prosperous condition, and we can see no reason why this improvement will not be continued during the coming year.

Valentine-Clark Company, Chicago: While we are not directly in the electrical field, yet our business is done entirely with electrical people in furnishing white-cedar poles. We are very well satisfied with the results of the last year, there being a natural steady improvement in business which seems to be gradually on the increase as the year draws to a close. As to the outlook for the year 1899, the prospects certainly are very flattering, not only as regards to a return of better prices, but also a very perceptible increase in the shape of inquiries, which not only tend to show condition of business in general, but also show the improvement when the orders come in reply to the inquiries.

Garton-Daniels Electric Company, Keokuk, Ia.: The year just closed has been the most successful year in our history. This has probably been due to the increased volume of electrical business, as well as due to the fact that buyers are now looking for and adopting goods with merit as their distinguishing feature instead of price. In the lightning-arrester line alone we find an increase of over 33% per cent. over last year's business. We have shared in the foreign business coming to this country, to a great extent our foreign orders during the year having amounted to more than double what they were in 1897. We have made more desirable connections abroad, and expect a very large increase in 1899. The outlook everywhere seems to indicate the most successful year in electrical history for 1899.

Elwell-Parker Electric Company of America, Cleveland, O.: We are glad to say that our business has improved, and especially so in the number of export orders. There is no doubt that abroad American electrical machinery is far in advance of the same product as turned out by the other countries. This is due to the undoubted fact that the American type of generators and motors possesses that most important combination of practical qualities, with the minimum of weight and first cost. We regard the outlook for the coming year, in our own business at least, as being most promising, both for this export business and for the business at home. We are sorry that we cannot report as correspondingly a satisfactory change in prices, and certain it is that the buyer of machinery is now in a position to purchase electrical machines on as advantageous prices as those of steam machines.

Emerson Electric Manufacturing Company, St. Louis: The general line has shown a decided increase over previous years. At the same time the natural tendency has been toward low prices and smaller margins of profits. The manufacturing of small wares in the electrical trade has suffered from large stocks thrown on the market by failures of supply houses and manufacturers, and prices have, as a consequence, been forced to a very low level. But during the last year the bottom appears to have been reached on prices; the surplus stocks on the market have been used, and an increased demand has resulted. After the usual quiet, consequent on winding up the year's affairs, we look for a large and steady improvement in regular lines, as well as in all specialties, and as the effects of the panic and war are now things of the past, good times are due and may be expected for the next few years.

Standard Underground Cable Company, Pittsburg, Pa.: The demand for our manufactures during the year 1898 has been very large, and while prices have ruled very low, the volume of business done by our company exceeds that of any other year in its history. Immediately preceding and during the war with Spain there was a slight reduction in amount of commercial inquiries and orders, but with us this was largely compensated by large government orders for submarine-mine and torpedo cables, as well as cables and wire for use in and about the fortifications. With large unfilled orders on hand extending well into the new year, and a great deal of new construction planned for the coming year, and the good general business and financial situation encouraging new enterprises, we have every reason to consider the prospect for 1899 quite favorable for ourselves and for electrical industries in general.

Pennsylvania Electric Company, Marietta, Pa.: There is room for but one opinion in regard to the electrical history of the last year, from an industrial standpoint, and that is, that it has been fraught with great success in the way of improvements in apparatus and volume of business done; the new inventions, improvements and applications of electricity have probably never been exceeded in any one year. As to the future outlook, appearances are favorable for a large business within the next year. The late elections deciding in favor of sound money, the high price of copper and the plethora of money in the United States are, to our minds, all very favorable indications. The high price of copper, indicating heavy demands from electrical manufacturers, is especially significant. In the independent telephone field there are signs of great activity, especially in the larger cities and in the construction of toll lines.

Safety Conduit Company, Rankin Station, Pa.: Manufacturing, as we do, a comparatively new line, that of enameled, or, as it is sometimes called, unlined iron-armored interior conduit, we feel very much gratified by the success of the business so far.

our conduit having been installed in a large number of the most important installations of the present year. As to the future, we believe that, so far as our business is concerned, it will take care of itself, as the demand is not only growing, but there is a considerable number of buildings now on the board for which our particular style of conduit is specified, so that we naturally look for an increased business. Speaking generally, we believe that all lines of the electrical trade should be congratulated, as everything has certainly been booming during the present year; besides, the opening of the foreign market to American production is another great success. And with regard to foreign trade, it should be the hope of all that the infant of 1898 will continue to grow and attain large proportions.

Shelby Electric Company, Shelby, O.: The closing year has been one of great satisfaction to this company. During the year our factory has operated on an average of 12 hours a day, and we have never been inconvenienced by the lack of orders. We judge that any manufacturer in the electrical lines, making an article of merit and disposing of it at reasonable prices, has had all that he could do. The history of the incandescent-lamp business, so far as we have been able to determine, is that the field is increasing with marvelous rapidity, and that it will continue to increase, and that although competition is strong and prices are low, a lamp of good quality can be sold at a reasonable profit. We think the tendency among consumers is to use better lamps. There are more consumers of lamps testing their purchases now than ever before, and this works greatly to the advantage of factories which have the ability to manufacture properly. We prophesy that the next 10 years will be the best years ever known in the various electrical lines.

Chicago Rheostat Company, Chicago: Viewed from the standpoint of the rheostat manufacturer, the distinguishing feature of the electrical industry during the last year has been the equipment of factories with electric-transmission systems. That which was but recently considered an experiment became the accepted practice of 1898. The application of electric motors to the various classes of machinery has called for numerous special controlling rheostats, in addition to largely increasing the demand for the standard types. If the demand for rheostats be a fair index of the demand for motors (and they usually go together), the motor manufacturer should be more than gratified by the business of the last year and the outlook for the next. Europe is practically without what we here consider up-to-date rheostats, and its demand for the American product is very active. The rapid increase in the number of electrically equipped factories and the development and extension of the export trade offer encouraging prospects for the coming year.

Lynn Incandescent Lamp Company, Lynn, Mass.: We take pleasure in attesting to an increased amount of business here and an ever-increasing inquiry from abroad. This latter demand has taken a great jump since our "expansion," and the year 1899 will surely open the eyes of this country as to what the business of colonial possessions means. We find a gratifying change in the demands of consumers for better goods. Many cheap lamps have been placed on the market, and, as is always the case, they sell for a while, and then comes the change and the call for a better article and belief in the old saying that "the best is always the cheapest." We note a tendency in many lines outside of electricity to an increase in prices and hope to see some of it in ours. No line of business puts more brains and labor into it than in all kinds of electricity, and the same should be properly rewarded. The result of this brain work is always in the way of a benefit to consumers. An instance is the designing of the anchored filament, which gives incandescent lamps a much longer average life.

Orient Electrical Company, Youngstown, O.: So far as we are able to judge, we believe that the past year has been a prosperous one in electrical lines in general. In our particular line (the manufacture and sale of incandescent lamps) we find that our sales during the past year have been very satisfactory indeed, and although there has been exceedingly sharp competition, prices have remained about the same during the year. Last year we had "trusts," and rumors of "trusts," but this year we hear but very little of these things. Manufacturers outside of the "combine" have set the price, and those on the inside have met these prices wherever it was found necessary to do so. Now that the prices of lamps have gone about as low as they can well go, the tendency—in order to secure and hold trade—is to improve, to the highest possible degree, the quality of the lamps furnished so that to-day lamps of the very highest grade can be had at low prices. The outlook for continued prosperity in electrical lines was never better; other industries are thriving, and with this will come an increased demand for electrical machinery and supplies of all kinds.

United States Carbon Company, Cleveland, O.: In no instance has the revival of business and the increase of confidence affected the industrial arts more than in the electrical field, which, throughout the dull and panic-stricken years, has shown a steady increase in all branches, and in none more so than ours, the manufacture of electric-light carbons. The development in electro-chemistry and electro-metallurgy has greatly increased in the last year, thus broadening the field in which carbons of larger and

more complicated forms are required. These requirements we have fully met by the installation of the largest and most powerful carbon machinery in the world. We may safely predict that the year 1899 will see a large reduction in the importation of foreign carbon, and a superior carbon of American make for enclosed arc lamps, and that it will not be long, under the "open-door" policy of the Republican party of our government, before our carbons, by their superiority, will be forcing their way into Europe and the colonies. As the carbon trade reflects the prosperity of the manufacturers and merchants, we can safely predict a brilliant outlook for 1899 and 1900.

Crouse-Hinds Electric Company, Syracuse, N. Y.: We are pleased to be able to write that the electrical business for the past year, from our standpoint, has been unusually satisfactory. Our business has doubled within the 12 months past, and we have been assured many times that the demand for the highest class of material in our line is increasing very rapidly. We manufacture only the highest grade of work in knife switches, switchboards and panel boards. We are not interested in the cheaper class of business, and only desire orders where quality of work is considered. We believe that the consumer of the class of material we manufacture is becoming more and more acquainted with the fact that it is poor business policy to spend any money for material of this description which is not the finest that can be purchased. In regard to the future, we think that the outlook for this year is most promising for the electrical business in our line, and in order to be in position to handle our increasing business promptly and satisfactorily to our customers, we have materially increased the capacity of our factory and made liberal investments in new and special machinery.

Hodge, Walsh & Loring Electrical Engineering Company, Kansas City, Mo.: Our business during 1898 has been considerably better than in 1897. We are engaged in nearly every line of electrical work except that of manufacturing, which we only do on a small scale. We have constructed about the usual number of electric-light plants for lighting towns in the adjoining states. Our supply business has been considerably increased, and the most activity in any of the electrical lines which we pursue has been in the construction of telephone exchanges. In Western Missouri and throughout the whole state of Kansas there are few towns of more than 2,000 inhabitants which are not supplied with telephone exchanges. We know of many places of less than 2,000 inhabitants which have from 50 to 100 telephones in operation. The outlook for the ensuing year in the different branches of electrical industries is exceedingly bright. We anticipate that the volume of business in 1899 will be considerably in excess of that of the present year, or, in fact, any recent year. This we believe to be a very conservative statement as to the present outlook of the different electrical interests in our territory.

Illinois Electric Company, Chicago: That the electrical business of the year has been a success stands without dispute. Prices are no higher than the year before, but there has been a healthy growth of new trade, which can be traced perhaps to the generally livelier conditions in other branches, and then, again, to the opening up of new territories of the United States. We, of the middle states, do not feel this so much as seaport towns, but as Cuba, Porto Rico, Hawaii and the rest are to be Americanized, they must also be "electricized." The worthy chiefs of the Philippines must ride in trolley cars as well as we. But, returning to the serious side once more, we do not ask for a boom in the electrical business; we simply wish the same healthy growth that we have had in the last year. One of the blessings we should be thankful for is the way in which the eastern factories stand by the western supply houses, thus enabling us to better gratify the general trade, and perhaps it would not be out of place to remark in this place the general fellowship of a thoroughly reunited country. We wish for all the general brotherhood of those connected with electricity all the benefits that are possible in the new year.

Standard Paint Company, New York: We have little comment to make on the business of the year 1898 in our electrical lines, certainly no complaints, for in spite of the war and other conditions which indicated, in the early part of the year, that business might be dull, we have sold more of our P. & B. armature and field-coil varnish, P. & B. electrical compounds and P. & B. insulating tape than in any other year since the formation of our company. The demand for the P. & B. products, not only in electrical lines, but in building, brewery, cold storage and other directions, has increased to such an extent that we found it necessary about a year ago to establish a branch factory to take care of our foreign business. This branch was completed about six months ago at Hamburg, Germany, and is now running regularly and is turning out the same goods as are manufactured by our home factory. As you doubtless know, business in the general electrical and electric-traction lines is very decidedly on the increase in most countries of Europe, and we are therefore already doing a very large business at our Hamburg works. The president of this company, Mr. R. L. Shainwald, who has given his particular attention to the establishment of our foreign

business, has just returned from Europe, and states that he is exceedingly gratified at the results already accomplished, and is as well confident that the business of 1899 will be far in excess of any previous year in the history of this company.

General Electric Company, Schenectady, N. Y.: There has been, so far as our information and experience goes, a most healthy and satisfactory growth in the electrical business during the last year, which has been reflected, not only in the increased orders to manufacturing companies, but in increased business of local lighting and power companies. Our orders this year are considerably in excess of last year in almost every line of electrical apparatus and supplies, and the indications for the coming year are most encouraging. It seems to us that, with the improved quality of electrical apparatus and supplies, together with the low prices now prevailing, and with the increasing attention which the local lighting and power companies are giving to the question of cheapening the cost of production of current and of adopting a comprehensive system of charges to customers (based directly upon the cost of the product), the electrical business, as a whole, was never in so sound and healthy a condition in this country as it is at the present time, and, as a consequence, capital for investment is attracted to the industry as it has never been before. We trust sincerely that the general improvement of the electrical business has found its way to the technical press as well, and that your own experience is as encouraging as ours has been during the last 12 months.

Roth Bros. & Co., Chicago: The year 1898 has proven to be a most excellent year for us; in fact, the total volume of business done during the year has exceeded any previous year since 1894. We have been so busy in our regular line that we are very much delayed in getting out a line of enclosed motors and dynamos. Although business has been somewhat flighty, especially in the earlier part of the year, the total has been very gratifying. Business in fan motors was not as good as we expected it would be, because of the cool summer; nevertheless, we did better than any previous year. Our local business has increased very largely over former years, and, inasmuch as inquiries are very good and buyers not looking for the lowest priced machine they can get, regardless of quality, the indications are that money is more plentiful and that the year 1899 will be the best ever experienced in the electrical business, so far as the line we are particularly interested in is concerned. Collections have been good and losses slight. We have not given much attention to the export trade, although we have made shipments to Asia, Africa, Australia and South American ports, besides a considerable amount to Mexico and Canada. In all, we are extremely well satisfied with the business done in 1898, and, from the present outlook, everything indicates a very big year in 1899.

Michigan Electric Company, Detroit, Mich.: As a whole we are perfectly satisfied with the year, as we find the volume of business in each of the different lines we deal in compares most favorably with the business of the preceding years, though naturally the margins have been somewhat closer than ever before, but during the latter part of the year there has been a marked and steady improvement which is still continuing. We believe the times are very often what one makes them, so that if one feels there is not any business to get, and consequently gives up trying, the natural result is that none will be secured. On the other hand, we have never seen the time when we did not feel that there was plenty of business to get if we only went after it properly, and, acting on this assumption, we have yet to find the time when we were not kept busy to our limit, with a possibility beyond, which we were unable to take care of. We believe that every indication points to the business of the next few years being better in our line, and in fact all others that we know of, than at any time during the past, though, of course, not with the possibility of as large margins as during the earlier years of the electrical business; but with a reasonable margin and improvements in quality now existing we think the business as a whole will be of more solid and desirable growth. As we are jobbers and contractors in almost everything in the electrical line, and also repair all sorts of electrical machinery and appliances, as well as manufacturers of electrical appliances, fixtures, etc., we are in a position to tell what the demand is in all these lines. We can only add that in every one of them we are at present as busy as we could reasonably desire.

Sterling Electric Company, Chicago: As a whole, the year has been one of success and general prosperity. There has been a general enlargement of plants, an increased number of consumers and an influx of considerable capital in the electric-light branch. The power, heat and transmission companies have each had one far-reaching, undertaking or important engineering problem and successfully carried them through. The traction companies have made thousands of miles of extensions, and with the closing of this year we find a much larger capital invested than in the year 1897. The telegraph companies have had a number of the times in the line of their business, and have done it to the pace. The electric power and light companies have had a very busy year, and a large amount of capital has been invested in the electrical field. The independent field has also been very busy, and it is estimated that hundreds of thousands of dollars have found their way into this field during the year just passed. The old-line company, the Bell, has expended hundreds of thou-

sands in improvements, toll-line extensions and fighting its opponents. The moneys invested in this field have earned a handsome revenue, and electrical securities, in general, are in demand. The outlook for the year 1899 could not be more promising. We refer especially to the telephone field. The new business, the extensions and increased facilities of all the companies will tax the manufacturers to their utmost to supply the demand. Our line of manufactures relates directly to the telephone branch. We are pleased to state that the year 1898 has been a very prosperous and satisfactory year for us, and from the amount of new business offering, and inquiries, we predict that the business for 1899 will exceed the most sanguine expectations. We wish to add that we thoroughly recognize the fact that the Western Electrician has been one of the leading factors and a great help in this year of prosperity in the electrical business.

Logansport Telephone Manufacturing Company, Logansport, Ind.: The last year has seen greater improvements, greater investments and better service than any year in the history of the independent telephone. Independent telephone plants and long-distance toll lines are no longer hampered by the necessity of buying cheap and unreliable apparatus. It is an undeniable fact that the start of the independent movement was not very encouraging to capital, but to-day the independent manufacturers can offer superior apparatus, with which up-to-date exchanges and long-distance lines may be equipped with and operated with minimum operating expenses, making it possible for a good percentage to be made on the investment, and at the same time the people be given good service at a reasonable rate of rental. Within the past year the independent companies have constructed twice the amount of miles of toll lines and installed four times as many telephones as the Bell companies have. The independent situation in Indiana is good. Within the next year every town of 5,000 inhabitants or over in Indiana will have an independent telephone exchange, and we presume that this condition of affairs exists in most other states. The year of 1899 will see a general reconstructing of toll lines, which means another impetus to business. Manufacturers would gain more by ceasing the foolish and childish habit of calling each other bad names and saying that they are the only people who have good apparatus, and all other is cheap and unreliable stuff. The fact is that there is plenty of good and reliable telephone apparatus on the market. There has been a radical departure from the old methods of telephony, both in the workings, workmanship and appearance. Switchboards, for instance, look no more like the switchboards of three years ago than a rubber-tired phaeton does like a wheelbarrow, and workings and service given from them are just as far ahead as the appearance. It has been the independent movement that deserves all the credit for the advancement in the art of telephony.

Electrical Engineering and Supply Company, Charlotte, N. C.: The influence of the last year in electrical business shows much improvement, particularly in the class of work that has been done—slower speed dynamos, more attention being paid to the design of switchboards and the details of plants. In other words, a higher grade of electrical work is being demanded, and some very fine work has been done, and you can now find as high-grade work in the South as anywhere in the country. The electrical business of the South is largely in isolated lighting, nearly all the cotton and woolen mills having their own dynamos. In many of the mills these dynamos have right hard service, as they run from 12 to 18 hours per day and sometimes 24, in the event of cloudy weather. There are a number of fine water powers, especially in North and South Carolina, Tennessee and Virginia, mostly undeveloped, largely because of distance from railroads. Two instances in this state are Roanoke Rapids, in the east, and Winston, in the west, the latter being at present developed to the extent of 1,000 horse power, but arranged to be increased to 2,000. The Winston installation is on the Yadkin River, situated 12 miles away, and is being used to run cotton mills, a woolen mill, a large flour mill and the light and power station. There is a healthy growth of town-lighting plants, and this is especially so, as there are very few towns of small size with gas-plants, only the larger places having gas. We do not think that acetylene gas will cut much figure in town lighting, as it has to show its equality to coal gas or electric light—a thing which, in this part of the country it has failed to do. In fact, we are disappointed that acetylene has not made better progress, because we think it has its place, and its success will add to rather than detract from the electrical business. We look to see the 220-volt system come into more general use in the South, as it has in the Northwest. We look for a healthy electrical business in 1899—no boom—and, owing to a higher grade of work demanded, hope for better prices, for we regret to say prices have been exceedingly low during the last year.

W. C. Sterling & Son, Monroe, Mich.: We think that the electrical history of the United States during the last year adds pages to the history of the progress of this nation. The business originating from the use of electricity during the last year has, in our opinion, passed all previous years. In the state of Michigan many miles of pole line have been built to carry telephone and electric street-railway wires. The largest independent telephone toll-line company in the United States, known as the New State Tele-

phone company of Michigan, of which we are directors, has built 2,500 miles of toll line, has opened 145 toll stations and 33 exchanges. We have shipped cedar poles as far south as New Orleans, where the Detroit Switchboard and Telephone Construction company is building a large independent telephone exchange, as far east as New York, and west of the Mississippi. As cedar-pole dealers, we are well informed as to the variety of companies doing construction work, and the increase in the independent telephone field during the last year has been enormous. We have shipped more poles in the last year, cross-arms and pins included, than in any previous year. It is only a matter of a year or so when Michigan cities will be connected with cities in Ohio, Indiana and Illinois by independent telephone lines. The telephone business will be much larger during the coming year, as local companies are becoming stronger and receiving more encouragement, and are branching out and constructing toll lines to connect their several exchanges together. Farmers, as well, are learning to understand that the telephone lines are a benefit to them as well as to any business man, and many farm lines are being built in Michigan. New electric-light and street-railway enterprises are not so numerous, although a large number of new roads were built in northern states, but the electric-light construction is quiet. Cedar poles are used entirely for all pole-line construction, and we are pleased to say that in the 20 years of our pole business the last year has surpassed them all, and we are preparing for a good year coming. Prices have advanced considerably and will be still higher next year, owing to the increased cost to cut and get poles to destination and the increased demand.

Eureka Electric Company, Chicago: The independent telephone field shows a marked change toward the use of a higher grade of apparatus than used in earlier years, and the manufacturer who is not awake to this growing demand for the best that can be produced will find that his business will show a falling off. An important development has been the attempt of the Bell company to purchase over 5,000 miles of independent toll line, consisting of not less than 70 independent plants, within the last year. Fortunately, the effort came to nothing. At first the Bell company was inclined to sue on "cobweb" patents. When it found that it could not gain by that method it bluffed. That plan also failed, and now the last resort is the endeavor to buy out competition. Particularly is this condition noticeable in central Indiana and Illinois, where the Bell people are just about to have thrust upon them the warmest competition from the New company at Indianapolis. The late Spanish-American war has also been of great value to the independent telephone industry. Many a small village was kept hourly informed upon important events going on at the front, of which it would have been wholly deprived had it not been for some independent company. The prospect for business and plenty of it is apparent, as plants that have been installed for several years are making changes in their central-office equipment for either high-grade apparatus of later date or enlarged capacities. Already we have many orders for early spring deliveries, and no doubt other manufacturers of good apparatus find themselves in a similar position. That the condition of the independent field is upon a good sound basis and that additional capital will find investment during the year 1899 can in no way be doubted. It now only remains for the companies to pull together, hold on to what they have already built and acquire additions, and in no line will they be able to find as good investment for their money. While our line embraces electric fans, arc lamps and other electrical devices, we are working heavily upon our switchboards and telephones. Already our McCordsville factory is running 18 hours a day in our endeavors to keep pace with our orders, and we anticipate an extremely large trade in this country and an opening trade in our new possessions during the coming year.

Standard Thermometer and Electric Company, Peabody, Mass.: The marked advance in the electrical history of the last year has been in the greatly increased use of enclosed arc lamps. These lamps are coming into very general use for both street and interior lighting, and the call for them, for both purposes, has been very brisk. In our opinion the demand for them has but commenced; the coming year will probably show even greater advance in the design and in the multiplicity of uses for these lamps over any similar period in the past. The foreign trade has been remarkably successful, both in volume and results. The use of the alternating current is so much more general abroad that the advent of a noiseless enclosed arc for this current has given us a great amount of business. We have reason to think that 1899 will call for a great many more lamps than 1898 for the continent and Great Britain. While here in the East general business has been pretty quiet in all lines, we have not been able to meet the demand for arc lamps at times, and have never been able to accumulate any reserve stock of lamps. We shall offer to the trade, early in the year, an entirely new line of cases for the Upton "Midget" lamps which cannot help attract attention and increase our sales. The worst feature of the outlook for new business is the keen competition forced on the whole trade by the largest maker of lamps in the country. This renders it exceedingly difficult to get satisfactory prices for arc lamps. The most hopeful feature is the very general increase in the use of enclosed

arc lamps, which means increased output and lower cost. The carbon duty made users and manufacturers of enclosed arc lamps rather anxious at the beginning of the year just closed, but the American manufacturer of carbons seems to have arisen to the occasion, and, for many purposes, the domestic carbons offered by him are as satisfactory as the much more expensive imported carbons. It looks as though the American carbons would find an export market in a very short time, if the improvement in quality is increased as much in the future as in the immediate past. If only Congress could be made to understand that certain articles of raw material, like mica, for instance, cannot be produced in this country, and would permit their importation free of duty, the electrical manufacturer would be helped.

Gordon Battery Company, New York: Our point of view is necessarily somewhat contracted, and our judgment cannot therefore be used as a criterion upon which to base any general inference. Our trade covers two distinct lines: First, the Gordon cell business, or that of primary batteries of the oxide-copper and zinc type; second, the sal-ammoniac carbon batteries, with incidental medical outfits, elec-

tric-lighting devices, etc. The Gordon cell industry is a comparatively new one, the device itself having been placed upon the market as a common article not earlier than the fall of 1895. The sales of this year are fully 50 per cent. greater than those during the corresponding months of last year. Our experience during the last year has supported the theory that better prices may be expected, as the recent advance of at least 12½ per cent. in the carbon and sal-ammoniac line is but a forerunner of a further advance, which will no doubt be made in the early part of the new year, and which we hope will be sufficiently liberal to allow all persons now in the business to make a fair profit on the goods manufactured. If the subject is approached from the standpoint of the volume of material moved in the year 1898, it shows an increase, but if it is viewed from the standpoint of values, then the business has not been equal to 1896 or 1897, as there has been a steady decline in prices on all carbon goods. This applies to everything except a few specialties. There is a tendency in the market to substitute lower grade goods for the better quality, and this, of course, cannot be fought successfully temporarily; it may last

for a year or two, just as the great war of shoddy swept over the woolen market some twenty years ago; and in a similar way the electrical trade has been in a demoralized condition throughout the country during the last few years, with but little light to be seen in the distance. Not a small proportion of the single-cylinder business done during the last year has been at prices based upon the actual losses; in fact, we doubt if there has been any carbon business in the battery line which has produced any profit. The competition among the manufacturers has produced two results: First, strong personal feeling—a desire to destroy the competitors; second, a desire to secure new business. We believe that the manufacturers have reached the point where they have learned the folly of pursuing the policy of destruction. We are confident that in the near future some satisfactory arrangements will be made by which prices can be advanced to a point where there is a fair margin of profit to the manufacturer. During a portion of the last year, single-carbon cylinders have been sold at a price which actually incurred a loss of from 15 to 20 per cent. to the manufacturers.

DEVELOPMENT OF THE TELEPHONE FIELD.

Telephone News from the Northwest.

(From the Minneapolis correspondent of the Western Electrician.)

The Harrison Telephone company contemplates a toll line between Armour, S. D., and Harrison.

A private company is to be formed at Appleton, Minn., to put in a telephone exchange.

The Northwestern Telephone Exchange company has put up two more wires between Litchfield and Willmar, Minn.

The District Court in St. Paul has held the Northwestern Telephone Exchange company exempt from a sewerage tax, because it pays a gross-earnings' tax "in lieu of all taxes and assessments whatever upon all its property held or used for, in or about the construction, repairing, renewal, maintaining and operating its system or lines." The tax in question was for the company's building at Fifth and Cedar streets.

The Eureka Telephone company of Eureka, S. D., is preparing to enlarge its switchboard. It has 71 instruments now in use.

The city of Des Moines, Ia., has begun suit against the Iowa Telephone company to prevent it from extending its system in the city. The city claims the company has no right there, and that its wires are a nuisance, which it asks to be abated. The telephone company has no franchise, and was some time ago notified to vacate, but it ignored the notice. The company says it will stand on its vested rights and will fight to the bitter end. The company is also working to increase its list of subscribers at New Hampton, Ia.

National Automatic Telephone Exchange System.

So great has been the demand throughout this country for a reliable automatic telephone exchange system that the accompanying cuts and description of the apparatus designed by Frank A. Lundquist, electrical engineer of the National Automatic Telephone company of Chicago, will be examined with particular interest. For over a year the instruments of this company have been in use, but the company has not heretofore aggressively pushed the development of its system. It now, however, presents for public inspection automatic exchange and subscribers' instruments that it feels confident will stand the most exacting tests.

As is well known, some owners of exchanges, in their efforts to meet existing conditions, have brought the rates so low, that under such methods the most rigid economy of operation is necessary. It is contended that the system herewith illustrated meets these requirements.

Referring to the cuts, Fig. 1 shows a five-line section of a 100-point switchboard; each line of two wires, forming the metallic circuit, comes in to one of the five mechanisms represented in the picture. The mechanism is quite simple and sure in its operation, as will be understood after a personal inspection. Every part is made by die and is as accurate in its action as the finest clockwork; in fact, the management of the National Automatic Telephone company says that men who were inexperienced have set up the apparatus and operated it most successfully.

Figs. 2, 3 and 4 show three forms of the National subscribers' telephone outfit. Fig. 2 is the subscribers' instrument, operated by two buttons at the side of the case of the transmitter in company with the use of the indicator shown on the face of the box.

In Fig. 3 is shown another form that is operated through the agency of a crank.

The company also furnishes a high-grade system of ordinary long-distance telephone that is suitable for general exchanges and toll-line service.

As will be readily appreciated by one having only a limited knowledge of telephonic devices, the most important features of this exchange system could only be thoroughly understood by personal inspection, for the mechanism presents a combination of devices impossible to represent pictorially.

The advantages claimed for the National Automatic over the manual-board system, both to user and promoter, are worth studying. Not only does the company claim that it obviates the expense of maintaining a central office, with its many employees, but eliminates as well a multitude of imperfections and annoyances. The expense of maintenance is reduced to a minimum and a great deal of annoyance is obviated by the National system. For instance, one cannot forget to ring off, can ring up immediately after having called once, and as many times as desired. The instrument signifies instantly whether

Telephone President Indicted.

As anticipated in the Western Electrician, the grand jury in Washington, D. C., on December 31st returned a true bill against Samuel M. Bryan, president of the Chesapeake and Potomac Telephone company, on the charge of violating the act fixing the yearly rental of telephones in the District of Columbia. The law, which was enacted last June, fixed the yearly charges at from \$50 to \$25, according to the number of telephones on a circuit and the character of the service provided. The company contended that the act was unconstitutional, and ad-

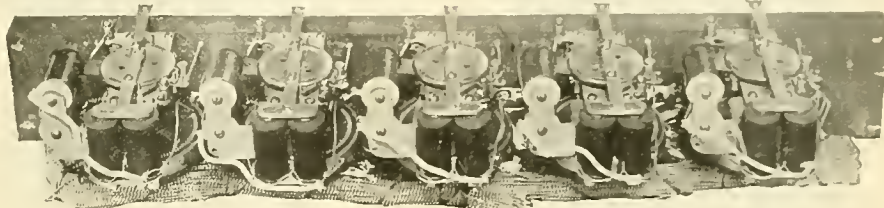


Fig. 1

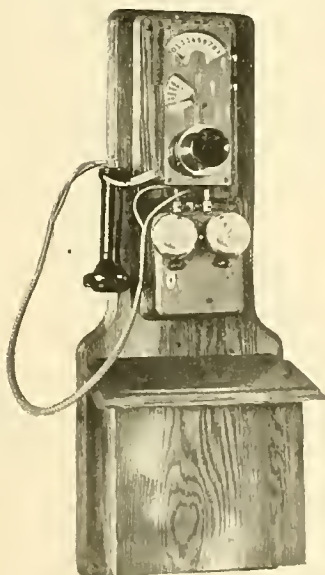


Fig. 2

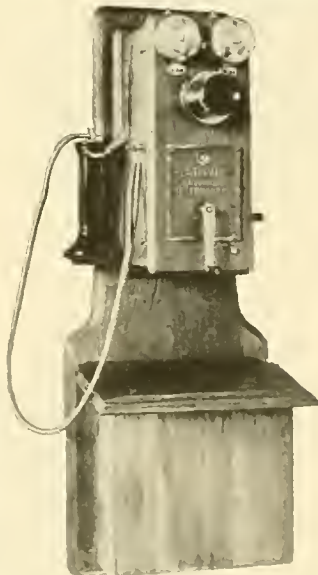


Fig. 3

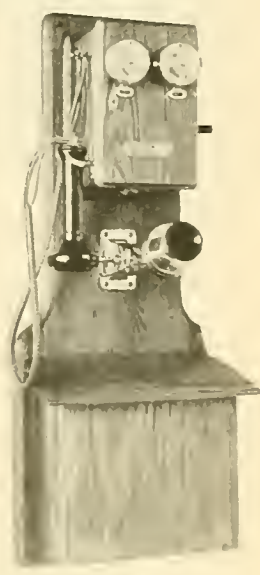


Fig. 4

NATIONAL AUTOMATIC TELEPHONE EXCHANGE SYSTEM.

the line wanted is busy. If a line becomes crossed or is in trouble, it is automatically disconnected so that it does not interfere with the working of the others. There is no time lost in calling Central and awaiting the pleasure of the operator to connect with the number desired.

Copper wire is not required in the National system. It is practicable for small towns and cities, where, owing to the cost of maintenance of a system where operators are required, the manual-board system could not be maintained.

Bell Company Absorbs Interstate.

A dispatch from Tuscola, Ill., December 31st, says: "The Bell telephone people have just succeeded in absorbing the Interstate Telephone company, which has headquarters in this city. The Interstate owned and operated several hundred miles of lines in central Illinois, and, as the Bell people threatened to cover the same territory, a compromise was effected whereby the Interstate goes out of existence and the Bell people will soon have a clear field."

hered to the former rates. The matter was taken up by a citizens' association, and many injunctions were obtained to prevent the removal of telephones upon tender by subscribers of the amount fixed by the act. These injunctions will soon be heard before the District Court on the constitutionality of the act in question.

Extensions and Improvements.

Construction work will be begun immediately on the telephone line between Bandon, Ore., and Rosa.

The Rocky Mountain Bell Telephone company will build a line to Idaho Falls in the early spring.

The Vinton, Cal., Telephone company has been incorporated; capital stock, \$20,000; directors, A. B. Huntley and L. H. Dunning.

Men are at work on the telephone line to connect Helena, Mont., and Spokane, Wash. D. S. Murray is general manager of the company.

S. G. Hugh's independent system of telephones is having poles put up at the rate of 75 a day for the new line to Portland and Forest Grove, Ore.

Two-rate Meter System.

Methods of providing central stations with continuous full load, so that the machinery may always run at maximum efficiency, or, in other words, the problem of supplying load at slack hours, attaining a uniform load, avoiding idle capacity and securing a constant revenue from all the station apparatus, is a subject of general interest to owners and managers of electric-lighting properties.

To load a lighting station up to its maximum output is not difficult during early winter evenings. All are conversant with the ordinary station curve, which shows a low level line from midnight to daylight, a sudden and disproportionate drop in the early morning hours, a sudden leap to maximum output by 5 p. m. and a steadily descending line to midnight. During 16 hours of the 24, fixed charges continue constant, and operating expenses are only slightly decreased, but the revenue shows a curve coincident with that of the load. The fixed charges on the apparatus which carries the peak have to be earned in a few hours each day. Reduction in price is, without doubt, the only means which ex-

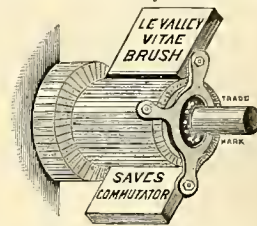
perience shows can be successfully employed to induce an increase in demand and a consequent employment of otherwise idle machinery in the station; but to effect this reduction in price and to give a consumer electricity at one price during the hours of maximum demand on the station, and at a reduced price during the hours of medium or minimum demand, a means of recording the consumption during two distinct periods is necessary. Such a load-modifying system, however, to be successful, must essentially be independent directly or indirectly of the consumer's local conditions and depend entirely on station conditions. The high rate of charge must be coincident with the maximum peak period of the station, the low rate upon the period of smallest demand, thus giving greater encouragement to the use of current at periods other than that of the station peak.

It will be seen that the two-rate system is based

two-rate meter system in station practice may be mentioned: First, one large and influential station, which has only recently adopted the two-rate meter, has not only added over \$20,000 worth of new business on the two-rate basis, but has also, and this is noteworthy, reclaimed \$10,000 worth of old lost business from the gas companies. Second, in cases where a consumer uses incandescent lamps, motors and incandescent arc lamps, he is usually charged a different rate for each character of the service, i. e., one rate for the incandescent lamps, another for the power service and still a different rate for the arc lamps. Each service measured separately requires a separate meter. These three meters could be successfully replaced by a single two-rate meter with consequent diminished expense to the station, and, very probably, greater satisfaction to the consumer.

Vitae Carbon Brushes.

The brush herewith illustrated is a treated carbon brush for motors, generators and dynamos, especially designed for saving the commutator and for securing long life. The manufacturers have made a specialty of street-railway motor brushes, and



VITAE CARBON BRUSHES.

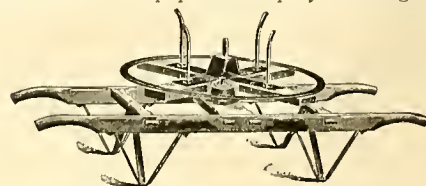
have been very successful in that branch. The company has a number of exceptionally strong testimonial letters from users of this brush, including one from an important street railroad, stating that the Vitae brush had run nearly 19,000 miles on one street-car motor in its service. These brushes have been on the market only a couple of years, but the business of the company has increased enormously. The manufacturers claim that this brush does not cut or wear the commutator and that it wears many times longer than any other brush; that it is a thorough self-lubricator and never gums the segment tips; that it requires no attention and runs seven to ten degrees cooler than any other brush, and that, having a greater conductivity, it conveys the entire current absolutely without loss; furthermore, that it leaves no deposit of dust in the motor, which is one of the causes of short-circuiting. The Le Valley Vitae Carbon Brush company of New York manufactures this specialty.

Dicke Ball-bearing Pay-out Reel.

This reel, it is claimed, is the only one of its kind manufactured, and its novel feature is the method of supporting the circular platform upon which the wire is placed. In the accompanying illustration two of the cross-arms of the reel are cut away, so as to give a good view of the truncated cone, on top of which can be seen a number of small balls. The reel revolves upon these balls, reducing the friction to a minimum. In practical work the friction is inappreciable, and whether the load be heavy or light there seems to be no increase necessary in the effort to operate the reel. The reel is manufactured out of the best white oak, is strongly mortised, ironed and bolted. The balls and bearings are made of tempered steel and will stand much use. The Western Electric company of Chicago is the exclusive agent for the sale of this reel in the United States.

Moto-vehicle Contract.

On Thursday of last week it was announced that Count de Jotemps of Paris, president of the American Motor General Agency, Paris, had made a contract with the Fischer Equipment company of Chicago for



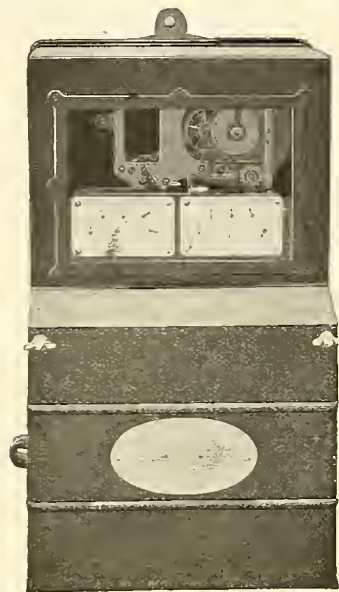
DICKE BALL-BEARING PAY-OUT REEL.

the delivery of 5,000 electric vehicles in the next 10 years.

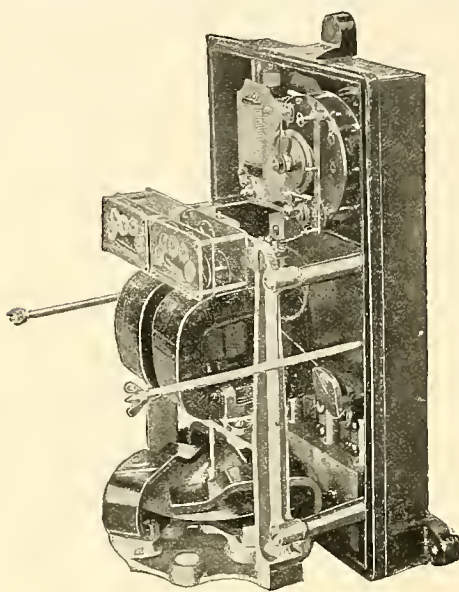
A representative of the Western Electrician interviewed C. E. Woods, electrical engineer of the Fischer Equipment company, and learned that the information was "about 50 per cent. correct." The company had indeed closed a large contract, and it was particularly gratifying that a Frenchman, after an examination of the most advanced foreign types, should select an American type of machine as against all competitors.

After closing the contract with the Fischer company, and before leaving Chicago for New York, Count de Jotemps made the following statement:

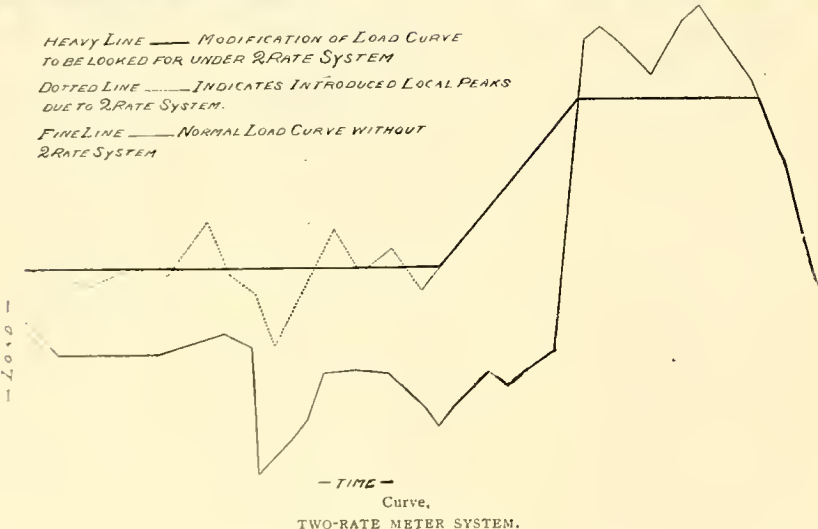
I came to America somewhat prejudiced against the automobiles manufactured here. The company of which I am pres-



Thomson Two-rate Recording Wattmeter, Closed.



Thomson Two-rate Recording Wattmeter, Open.



entirely upon the condition of the station—that of supply and demand, and not upon any conditions local to the consumer. The condition of the load on a station using two-rate meters is also shown by the curve. With the discouragement of local peaks coinciding with the main-station peak, the really objectionable peak is a steady stimulation to creation of local peaks not occurring at the same time as the station peak, and this, putting a premium on heavy consumption when the station is lightly loaded, not only breaks down the main peak but also tends to build up the average station line by the introduction of the local peaks. It does not, however, discourage the small consumer, since he benefits as much by the low rate during the period of minimum demand as does the large consumer. He is encouraged in the same ratio and, securing his current cheaper, is prone to increase his consumption, tending to raise the average load line of the station. The heavy line curve shows the result which will probably be obtained.

The two-rate meter system is equally desirable for, and may be applied to, direct and alternating-current circuits, but the meter is not interchangeable, direct-current meters being used for direct-current circuits and alternating-current meters for alternating-current circuits.

Two examples of the influence of the use of the

careful consideration of this question of station load has brought about the development by the General Electric company of a two-rate recording wattmeter with two dials and an electric or self-winding clock. By means of the clock, the consumption of the meter may be changed from one dial to the other at any predetermined hour of the day. The meter itself rotates with unchanged accuracy at all times according to varying consump-

ident was organized for the purpose of selling automatic vehicles. We tried every machine of European invention, but none of them came up to popular demands. Then we saw some of American manufacture and I was instructed to come to the United States and see in what respect the automobiles in this country surpassed ours.

Upon reaching Boston I was simply overwhelmed by the makers of every form of automobiles. There were those propelled by steam, gasoline, electricity and every conceivable power. Finally, I decided upon a race as a test. Among the electric vehicles the Woods machine, manufactured in Chicago, was easily the best, and so I came here to make the contract with the makers.

While the electrically propelled vehicle is superior to all others because there is little vibration and because it is the simplest of construction and manipulation yet there are many Europeans who prefer carriages propelled by other mechanism. To satisfy these customers I have made further contracts with three eastern makers for the delivery each year for the next ten years of automobiles propelled by steam.

The Fischer company was established about a year ago for the manufacture of automobiles of the Woods model. This is the largest contract it has made, and the company and Electrical Engineer Woods, certainly deserve credit for the energetic manner in which they have pushed the electric-carriage business in this country against many obstacles and during a period when, to say the least, money for luxuries was scarce.

Progress Dry Battery.

The Phoenix Carbon Manufacturing company of St. Louis is now pushing a form of dry battery that is worthy of careful consideration on the part of the electrical trade.

The primary requirement of a dry cell is that it

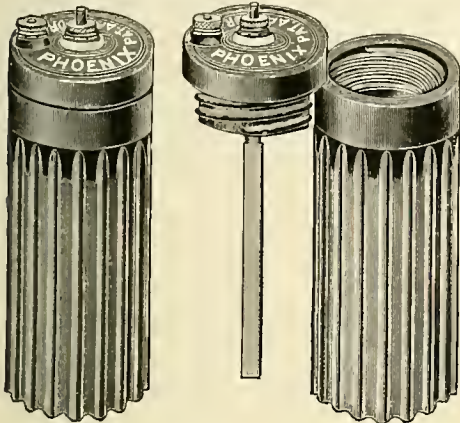
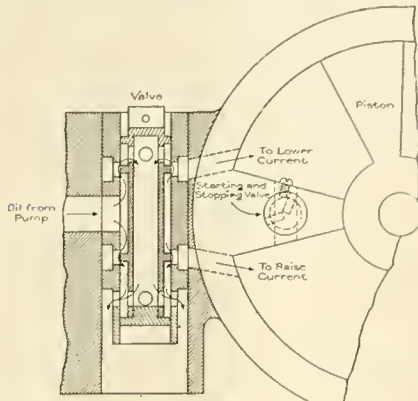


Fig. 1. PROGRESS DRY BATTERY. Fig. 2.

shall have long life, and in carrying out this object the Phoenix company uses a containing vessel whose walls are sufficiently porous to allow moisture from the atmosphere to pass through them, and a filling having in close association with the excitant a material capable of absorbing moisture from the atmosphere. A battery is thus produced capable of maintaining its excitant mixture in a moist condition and consequently active for a long period of time.

bon, in the form of a cylinder, provided with vertical ribs on the outside for strength. The carbon of this vessel is of the quality commonly used for the negative elements of batteries, which, owing to its granular nature, is very porous.

Inside of the vessel is placed a filling in a gelatinous or semi-solid state, and containing an exciting material, such as sal-ammoniac, and also a material capable of absorbing moisture, such as chloride of calcium. These materials are intimately associated in the semi-solid mass, so that any moisture ab-



Section of Valve, Middle Position.

BRUSH ARC GENERATOR REGULATOR.

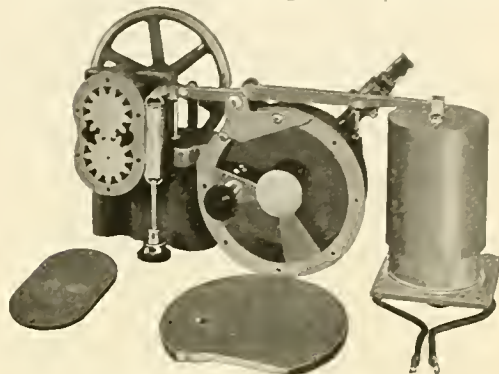
sorbed by the chloride of calcium will be imparted to the other material of the mixture, and so maintain the entire mass in a moist condition. The positive electrode is a pencil of zinc, and occupies an axial position in the vessel, and so is surrounded by the semi-solid filling. A layer of depolarizing material placed between the semi-solid filling and the carbon element performs its usual functions.

Since it is not necessary or desirable to seal the top of the cell a cover is used which screws into place or interlocks with the vessel. This also is made of carbon, but harder and less porous than that of which the vessel is made. In this cover a metallic post is imbedded and fitted with a binding nut for a circuit terminal. The positive electrode projects centrally through the cover, being insulated from it by a porcelain bushing, provided at its outer end with proper binding devices for the other terminal of the circuit.

The Phoenix company finds that a battery constructed in accordance with this description remains active for a much longer period than types of battery which are sealed, the increased life being due to the fact that the chloride of calcium in the filling draws moisture from the atmosphere through the porous walls of the containing vessel and into the semi-solid mass, maintaining the latter in substantially its normal and original condition. When the positive electrode is consumed it is obvious that by means of the readily removable cover another

Brush Arc Generator Regulator.

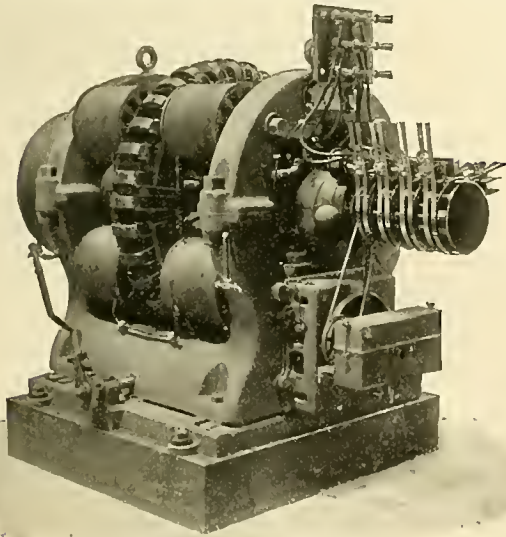
As the series arc-lighting generator has been gradually increased in size the adoption of improved methods of regulation has become more imperative. The nerve center of a series arc system being the regulator, however nearly perfect the other apparatus may be satisfactory lighting cannot be obtained unless the regulator itself performs its full duty. The General Electric company has, therefore, developed for four-pole Brush arc generators the regulator herewith illustrated. It is simple, both in construction and operation, its mechanism being contained in a rectangular case placed on the



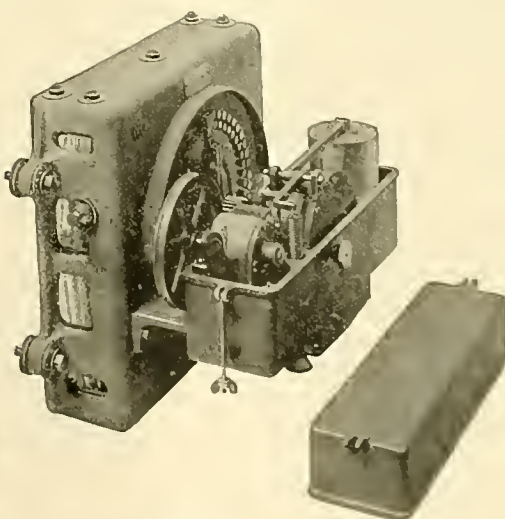
Case Removed, Showing Working Parts.

machine directly beneath the commutator. A separate wall controller is not required; hence no additional leads need be run from the generator. In maintaining constant current the regulator performs two simultaneous operations, namely, it sweeps a set of rheostat contacts, varying the resistance of the field shunt and rocks the brushes back or forth to keep the spark length at a minimum.

The mechanism consists of a rotary oil pump, driven by a belt from the armature shaft, a rotary piston in a short cylinder with ports and a balanced valve, which regulates the flow of oil into the cylinder. The valve is operated by a lever which supports the armature of a controlling electromagnet, energized by the main generator current. The pull on its armature varies, therefore, with this current. At normal current the valve is in its middle position and the oil may flow through the overlapping ports and back into the case, without moving the piston. Should the current rise above normal, the controlling armature is drawn down, raising the valve and diverting the oil through the upper ports into the piston, at the same time allowing it to run out from the piston case through the lower ports, as the piston rotates in a clockwise direction. As the piston is mounted on a shaft moving the rheostat arm and the brush-holder rocker arm, its movement immediately corrects the rise in current. When the current returns to normal the controlling magnet releases, and the valve lowers and prevents further



Brush Multipolar Arc Generator with Regulator.



Regulator.

BRUSH ARC GENERATOR REGULATOR.

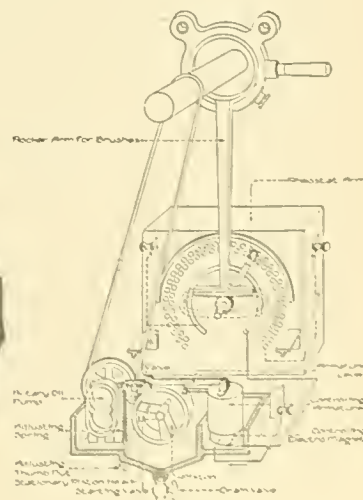


Diagram of Parts.

It is well known that many types of dry cells lose their efficiency by reason of the drying out of the filling, and that this occurs notwithstanding the fact that attempts are made to effectually seal the cell. Instead of sealing the cell the Phoenix company exposes its contents to the atmosphere for the purpose above stated, making the porous containing vessel of carbon and utilizing it as the negative element of the cell, which affords obvious advantages.

A cell of battery made in accordance with these ideas is illustrated in the accompanying cuts, showing the cell complete, Fig. 1, and also with elements apart, Fig. 2. The containing vessel is made of car-

bon, in the form of a cylinder, provided with vertical ribs on the outside for strength. The carbon of this vessel is of the quality commonly used for the negative elements of batteries, which, owing to its granular nature, is very porous.

Attorney-general Crow has filed a petition in the Circuit Court to deprive the Lindell Railway company of St. Louis of its franchise, contending that the franchise is in violation of the law prohibiting the granting of a right to lay a street railway within three blocks of an existing parallel line. He also asserts that the statutes prohibit the Lindell and other companies from purchasing independent lines. The Lindell system was recently sold to a syndicate represented by Brown Brothers of New York.

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moved toward its middle position, which it reaches just as the current returns to normal.

It is evident that the piston and, therefore, the rheostat arm and the brushes will move more rapidly when the ports are wide open than when they are nearly closed. The means for correcting variations of current are thus most effective when most needed. The actual time required to bring the current back to normal from a dead short-circuit is from $3\frac{1}{2}$ to four seconds. The use of rapidly moving reciprocating parts has been avoided, and when properly adjusted the regulator operates without oscillating action.

At one end of the armature lever is an adjusting spring, the tension of which is regulated by a hard-rubber knob outside of the box. With this spring the armature may be adjusted for a predetermined current, and this is the only adjustment necessary. As the spring is not in circuit and is not subject to temperature changes, the adjustment is not likely to change. The adjusting knob may be handled without danger when the machine is in operation. The stops for the controlling lever may be so arranged that the regulator may operate more quickly in one direction than in the other, while a device is provided which allows the regulator to be thrown entirely out of operation. A change in direction of rotation of the generator requires in the regulator only a change in the position of the two stopper plugs in the oil pump. A safety valve is provided to relieve the pump from excessive pressure. All electrical connections of the regulator are made to stationary binding-posts, and there are no sparking contacts. As the case is dust-proof, destructive grit resulting from sandpapering the commutator cannot affect the regulator, and as it is partly full of oil at all times the bearing surfaces are thoroughly lubricated and wear is consequently reduced. Thus, thorough protection of the mechanism and careful provision for its lubrication increase the reliability of the regulator, and it will remain longer in proper adjustment and require far less repair than one exposed to dust and dirt.

This regulator has been built so that it may be substituted for the "Form 1" regulator (operated by magnetic clutches), either with new rheostat or fitted to the old rheostat.

CORRESPONDENCE.

New York Notes.

New York, January 3.—With the New Year the Rapid Transit Commission bobs up smilingly with a proposition to apply to the Legislature for authority to bond the county of New York for money to construct the proposed tunnel. All the commissioners except the representatives of the city government have been in favor of this plan. Comptroller Coler is opposed to it. After yesterday's meeting he said that he did not think any member of the board would consider the county bond scheme seriously. Secretary DeLafield said later that the expediency of the plan had been questioned by some members of the commission. He said, however, that no offer of private capital to build the road had been received from any source. The commission voted to appoint George L. Rives and Comptroller Coler a committee to prepare a memorial to the Legislature setting forth the exact condition in which the plans for rapid transit are now. This memorial, Mr. DeLafield said, would be of such a character that all the members of the commission could unite in signing it.

The latest objection to the plans of the commission is based upon the claim that the transformation of surface lines into electric railways has removed the principal reason for the building of the tunnel.

The four-track scheme was an excellent one when it was planned, but it is now obsolete, and it is no longer the best or wisest plan of furnishing real rapid transit for New York city. When the rapid-transit scheme was originally planned the surface street railways of New York were operated by horses, or, in a few instances, by cable traction. The coming year will see practically all the main north-and-south surface lines operated by electricity, and, in other words, the local tracks for the New York rapid-transit railway have been laid and are now in operation on the surface of the streets. If the local lines of the proposed rapid-transit railway were now completed and in operation, they would be forsaken by travelers for the electric cars on the street surface. Passengers will not walk even a block or two and descend to an underground station when they can take an electric car on one of the surface roads at the nearest corner. Further, the rate of speed, including stops, obtained on the present electric conduit roads is nearly or quite as good as what the proposed local trains of the New York rapid-transit railway could make.

A report has been circulated in Hoboken to the effect that the controlling stock of the North Hudson County Railway company had been purchased by the North Jersey Street Railway company, which operates lines in Hudson and Essex counties. The capital stock of the North Hudson County Railway company is said to be about \$5,000,000. The North Jersey Street Railway company, of which E. F. C. Young of Jersey City is president, wants to obtain control of all the street-railway lines in Northern New Jersey. It is said that the company is also

negotiating for the purchase of the Jersey City, Hoboken and Rutherford railway. Bernard M. Shanley of Newark, who is manager of the North Jersey company and a large stockholder in the company, has this to say of the deal: "For upward of five years I have owned, with others, a quarter interest in the North Hudson company, and now we have purchased from J. O. H. Pitney enough of the stock of the company to secure us the controlling power; but the company will be run as the North Hudson company, and will be entirely independent of the North Jersey company." It will probably come under the heading of "friendly interest."

The New York Autotruck company has been incorporated, with capital stock of \$1,000,000, to manufacture motors for heavy trucks. Compressed air is to be the motive power employed, it is understood, and it is said that the new motors will be much more powerful than any storage-battery equipment now in use, and at the same time will weigh less than half as much as such motors. M. S.

PERSONAL.

Gen. S. T. Carnes, president of the Memphis Light and Power company, and Mr. Frank G. Jones, general manager of the Memphis Street Railway company, spent the last day of the old year in Chicago.

The first order issued by Governor Roosevelt upon taking oath of office was the appointment of his staff as commander of the National Guard. Lieutenant-commander Samuel Dana Greene was selected as aide-de-camp to represent the naval militia.

James Partridge, general manager of the Partridge Carbon company of Sandusky, Ohio, was a Chicago visitor last week. Mr. Partridge's visits to Chicago of late have been so few and brief that they are regarded as unusual events by his many friends in the trade.

James W. Thomson, Jr., superintendent of the Mitchell, Ind., Telephone company, died on December 24th, after three weeks' illness. Mr. Thomson was favorably known throughout the state, especially in independent telephone circles. He was buried at Jeffersonville, Ind.

Mr. Dewey Newman, formerly of the Central Electric company, will in the future represent the Illinois Electric company in the states of Illinois and Iowa. Mr. Newman entered upon his duties the first of the year. He will attend the meeting of the Northwestern Electrical association in Milwaukee in the interest of the Illinois Electric company.

The Fort Wayne club has adopted resolutions expressing the sense of loss sustained in the death of R. T. McDonald. It has been suggested that a marble slab be placed on the walls of the works of the Fort Wayne Electric corporation, bearing a suitable inscription relating to the establishment of the business by Mr. McDonald.

Charles G. Burton, for the last five years occupying an important position with the Central Electric company, will be associated with E. B. Kittle, western manager of the Sprague Electric company at Chicago. Mr. Burton brings into his new field of work an experience of 15 years in the electrical business. He was one of the pioneer electrical salesmen in the West, and among the first to push Brush apparatus. During the last two years with the Central Electric company he was in charge of that company's advertising department, and his successful and original work in that direction attracted unusual attention.

Robert Hemingray, a pioneer glass manufacturer, died Tuesday, December 27th, at his home in Covington, Ky. Mr. Hemingray had been ill for three weeks with heart trouble, but it was not of a serious nature until just before his death. He was said to be the oldest glassware manufacturer in the country. He leaves a wife, three sons—Ralph, Robert and Daniel C.—and two daughters—Mrs. Bradford Shinkle of Covington and Mrs. W. H. Felix of Lexington. The funeral took place from the family residence Thursday noon, December 29th. Mr. Hemingray was for many years one of Covington's foremost citizens. Of late years he had retired from active business, leaving his large interests in the manufacture of glassware to his sons. He was born near Johnstown, Pa., and settled at Covington in 1847. One year later he founded the Hemingray Glass company, which has since been conducted by himself and his sons.

W. J. Clark of the General Electric company has accepted the position of general manager of the foreign department of that concern, with headquarters in New York. In the reorganization of the foreign department Mr. D. Mazenet, who, for five years, has held the general managership, and who has piloted it from a small beginning to its present position as one of the foremost departments of the company, becomes managing director of the Mexican General Electric company, with headquarters in the city of Mexico. Mr. Clark's wide experience in foreign commercial matters peculiarly fits him for his new position. He has traveled through Europe, as well as in the countries south of the United States, and his familiarity with foreign methods and manners will prove an advantage. His book, "Commercial Cuba," recently published, is already generally

acknowledged to be the standard authority on Cuban commercial affairs. He will be greatly missed from the railway department, in the management of which he made a unique record.

ELECTRIC LIGHTING.

The Bureau of Yards and Docks of the Navy Department is inviting sealed proposals until January 14th for extending the electric-light system at the New York Navy Yard. Specifications, blank forms of proposal and a general plan will be forwarded to intending bidders upon application to the bureau at Washington, D. C., or to the commandant of the yard at New York. Bidders are expected to inform themselves of the character of the work by visiting the yard.

Chicago's city gas inspector, Maurice O'Connor, reports that during the last year 4,797 gas lamps and 118 gasoline lamps were discontinued, mainly on account of the installation of electric lights by the city, and also to keep within the appropriation made for the Gas Inspection Department. The number of gas lamps in service January 1, 1898, was 33,042, and of gasoline lamps at the same time, 10,224; total, 43,266. The number of gas lamps in service December 31, 1898, was 28,245; gasoline, 10,106; total, 38,351.

ELECTRIC RAILWAYS.

The Westinghouse Electric and Manufacturing company on December 24th shipped a large quantity of electric-traction supplies for a street railway in Corea.

Buildings occupied by the Rochester, N. Y., Railway company for car sheds, shops and offices were burned on January 1st, and their contents destroyed. The loss is estimated at \$50,000. The property was fully insured. There were 14 cars burned and several trucks damaged. The company's service is crippled temporarily by the destruction of the cars and trucks, but it hopes soon to replace the rolling stock and buildings.

Indianapolis is at present the scene of operations of a syndicate looking to the combination of street-railway lines. The Citizens, which holds all the streets, but has no franchise after 1901, and the City company, which has a franchise, but no tracks or rolling stock, are the properties interested. It is said that John P. Frenzel, one of the largest holders of stock in the City company, has been in consultation with the directors of the Citizens' company in Philadelphia, and that, at least, the basis of a deal has been discussed, and consolidation partially agreed upon. The fact is recognized that the Citizens' company has a decided advantage over any rival, because it possesses long-time franchises in all the suburbs, which were secured before the suburbs were added to the city. These are the manufacturing centers, and as the Citizens' company has tracks on all the streets leading to them, the City company must either buy its way out or stop its lines inside of the city proper.

PUBLICATIONS.

The Electric Appliance company has ready for distribution a complete catalogue of Whitney electric instruments. The Whitney instruments are too well known to require any particular comment, and this catalogue should be in the hands of every buyer of test instruments.

The latest pamphlet issued by the Electric Storage Battery company of Philadelphia is of special interest to street-railway companies, as it describes the battery plant of the South Side Elevated Railroad company of Chicago and explains the advantages of such an auxiliary. The considerations which influenced the engineers of the company in adopting batteries in this particular case are thus summarized: "First, batteries could be installed in one-third the time, and the demand was pressing. Second, the batteries would cost no more than the feeders necessary to transmit the additional current to the termini of the line, if generating units were added to the power station. Third, by smoothing out the extreme fluctuations and taking a portion of the peak of the load during the time of heavy traffic morning and evening, the batteries would increase the capacity of the power station 25 per cent."

CALENDARS.

The standard of the Wabash is proudly borne by the Continental Limited in the artistically designed and executed calendar issued by that railroad company.

"Neat, attractive and dignified" are terms that exactly describe the calendar issued by the American Electrical Works of Providence. As usual, this concern is on hand with the compliments of the season, and it takes the best way of constantly reminding its patrons and friends of its mission by supplying them an attractive and useful calendar.

The H. T. Paiste company of Philadelphia is issuing to the electrical trade a very artistic calendar for 1899. The subject is "Good Night," by Grust, and is a beautiful reproduction of the lights and shadows which make this painting famous. Copies

will be sent upon receipt of four cents in stamps, to cover expense of mailing.

"Ruins of Conway Castle, North Wales, built in 1284, by Edward I." is the title of the artistic illustration which graces the calendar issued by the Warren Electric and Specialty company of Warren, Ohio.

One of the daintiest of the season's calendars is that distributed by the Okonite company. It consists of a prettily tinted picture, with a cardboard mat around it. Below the picture, on the mat, is the calendar proper on monthly tear-off sheets. In the upper left-hand corner is the well-known Okonite trademark, and there is no other advertising matter on the calendar.

"Soldier girls" are again supplanting soldier boys in popular favor, judging from the prevailing fashions. The G. F. Brunt Porcelain Works of East Liverpool, Ohio, have taken advantage of this sentiment in preparing their calendar, which is an attractive collection of portraits of "soldier girls," prettily attired in costumes designed after the style of the army and navy uniforms.

ELECTRICAL SECURITIES.

The Third Avenue (N. Y.) Railroad company's report for the third quarter of the last year shows a marked decrease in the gross receipts and a slight reduction in operating expenses. The difference in the net earnings was \$97,637. The company's earnings amounted to \$572,620, and operating expenses \$351,585.

The Edison Electric Illuminating company of New York reports gross earnings for November of \$286,940, an increase of \$39,645 as compared with the same month of last year, and net \$142,373, an increase of \$9,802. For the three months ended November 30th the gross earnings were \$2,711,602, an increase of \$505,972 as compared with the corresponding period of last year, and net \$1,134,059, an increase of \$156,237.

A petition for a writ of error was filed in the Appellate Court at Chicago last week by stockholders of the "Alley L" in the case of the foreclosure decree for \$11,400,707, granted in the Circuit Court June 29, 1896, to the Northern Trust company and the Illinois Trust and Savings Bank against the elevated railroad property. The petitioners ask to have the decree reviewed and the amount reduced to \$3,000,000. The decree allowed the foreclosers possession of \$700,000 worth of real estate owned by the railroad, \$186,375 cash on hand at the time of the finding of the court, as well as the right to operate the road. The error, it is alleged, was in including the money and real estate, as the mortgage on which the foreclosure was had did not include these items. It is also set forth that the decree wrongfully included the amount due on other bonds issued by the Illinois Trust and Savings Bank.

MISCELLANEOUS.

The War Department, through the United States engineer at Norfolk, Va., is inviting sealed proposals until January 24th for furnishing and setting up four storage batteries at Fort Monroe, Va. Information will be furnished upon application to Maj. Thomas L. Casey, 166 Granby street, Norfolk, Va.

TRADE NEWS.

"We're all one year older! Well, never mind. Here's best wishes for 1899," is the greeting of Charles D. Shain of New York to his numerous friends.

Users of wire and cable are reminded of the facilities of the Standard Underground Cable company of Pittsburg for handling their orders, by a neat souvenir in the form of a combination foot-rule and wire gauge.

During the year the Link-belt Machinery company of Chicago found it necessary to run the entire factory at night as well as during the day for seven months. At all times of the year full time was made. The company's business showed great improvement.

The G. F. Harvey company, manufacturing chemist, Saratoga Springs, N. Y., is placing on the market an article to which it desires to call the special attention of managers and engineers of power plants. It is a liquid called Vitogen, for burns and scalds, for which the company makes strong claims. The company cites many cases where Vitogen was used with wonderful results. This article seems to possess merit. All interested are requested to address the company for its booklet on Vitogen.

The Commercial Electrical Supply company of St. Louis continues to enjoy an unusually good trade. The company is at present rushed to fill orders and the management considers that the coming year will be one of its best. The Commercial Electrical Supply company of St. Louis has an enviable reputation for fair treatment of customers. President Joseph Franklin, Jr., and Manager of Sales Paul D. Cable are always on hand to greet whoever may come to town to visit this "emporium of electrical supplies." The Commercial company is at present engaged upon

the compilation of a new catalogue. It will possess many desirable features and be a volume of great usefulness to the trade.

The Zeco arc lamp is meeting with great success in the hands of the Central Electric company of Chicago. President George A. McKinlock recently stated that not only had large orders been booked for the lamp, but the most satisfactory reports as to its actual service have been received. For some time the Central Electric company has been so crowded with orders that it has been unable to make prompt shipment, but now the stock has been increased so that all orders can be taken care of with dispatch.

The Western Electrical Supply company of St. Louis, Mo., reports very flattering sales this season of switches, of which it carries a very large and well-assorted stock at all times, and is able to ship on receipt of order any standard switch on the market. Parantite and Peerless rubber-covered wires, for which this company is agent, have never before received the patronage of this season, which is considered a very high compliment to the merits of the wire. The company also reports good sales on the general line of supplies and a constantly increasing trade on general electrical supplies of every description and electrical apparatus, in which it is a heavy dealer.

All those who propose going to the convention of the Northwestern Electrical association at Milwaukee, January 18th, 19th and 20th, will do well to engage their rooms at the Pfister Hotel ahead of time. A representative of the Western Electrician recently visited Milwaukee and found the manager, Al Severance, preparing for the coming convention. It will be remembered how, through the courtesy of Mr. Severance, the last year's gathering at the Pfister was made a most delightful affair, and one that will long be remembered. Mr. Severance certainly did all in his power to make everyone have a good time, and without doubt this year's convention will see a repetition of his unflinching courtesy.

BUSINESS.

William Roche of New York reports flattering orders for all sizes of New Standard dry cells, from the 1 3-16 to three inches diameter and two to seven inches in height of body. The users of dry cells recognize the claims for superiority in strength, life, quick recuperation and practically no internal action.

The Central Electric company reports largely increased sales in the line of transformers, enclosed arc lamps, high-grade knife switches and switchboards. It is enjoying unexcelled facilities for manufacture, and has recently furnished some large and elaborate boards. The company's new catalogue, just published, lists a line of special tablet and cut-out boards not shown in any other publication.

One of the busiest concerns in Chicago is the Swarts Metal Refining company, located at 20 North Desplaines street. As is well known, this concern makes a specialty of purchasing old copper wire of any description and in any quantity, and it pays the highest market value. The business of the Swarts company has been built up to large proportions through the efforts of Seymour Swarts, its popular president.

The Electric Appliance company has taken the selling agency for the two-ball lamp adjuster. Great claims are made for this adjuster as to simplicity, durability, etc., one of which is that as there are no springs and special mechanism used in the device, it cannot get out of order and is practically indestructible. It is inexpensive and at the same time ornamental, and is intended to displace similar devices which depend upon springs and other mechanism.

Electrical contractors know of the Wrigley toggle bolt and other specialties, placed on the market by Thomas Wrigley, engineer and machinist, 300-306 Dearborn street, Chicago. Mr. Wrigley has supplied many thousands of these specialties to the electrical trade, and his business has been most gratifying during the last year. He is getting out a number of new specialties, and those interested in articles of this kind might learn something of interest by communicating with him.

The United Gas Improvement company of Gloversville, N. Y., is erecting a new plant, consisting of generator house and boiler and engine house. The building is about 50 feet wide and 80 feet long. It will be fireproof throughout. The sidewalls are of brick and the roof framing of steel, which will support slate-roof covering. The trusses are clear span—no interior columns—and rest directly on the side walls of brick. The steel work was furnished and erected in place by the Berlin Iron Bridge company of East Berlin, Conn.

The Farr Telephone and Construction Supply company, 357 Dearborn street, Chicago, is doing its best to keep up with the demand for its well-known products. Nearly every telephone man in the country is aware of the popularity of the Farr products, and many independent telephone exchanges are taking advantage of the present inducements the company offers to purchasers. The Farr company is just now placing on the market

a magneto bell which is cheap in price only, and is guaranteed. It is said to be giving the best of satisfaction.

Secretary and Treasurer A. C. Garrison of the Columbia Incandescent Lamp company was recently interviewed on the outlook for the lamp business during the year 1899. Mr. Garrison was most enthusiastic over the prospects, particularly for his own company. The Columbia Incandescent Lamp company has unflinchingly maintained its policy of lamps "unequaled in quality," and it would seem that this had been a winner, for the market is now in a condition where, while many cheap lamps are purchased, nevertheless, the greater proportion of buyers are inclined to pay a fair price and secure a thoroughly reliable and satisfactory incandescent lamp.

The Turner water-tube boiler, manufactured at Bucyrus, O., is meeting a very prompt acceptance on the part of some very critical and extensive steam users. These boilers are made in sizes from 100 to 500 horse power. At present contracts are in hand for two of 100 horse power for the Standard Snuff company of Nashville, Tenn., two of 500 horse power for Midland Steel company, Muncie, Ind., and three of 225 horse power, together with piping, boiler feeders and large stack, for the Indianapolis Ice and Cold Storage company. The boiler embodies two or three new features. The Turner Engineering company of Bucyrus is the maker of this boiler.

One of the signs of the revival of good times in the electrical trade comes from the Phoenix Carbon Manufacturing company of St. Louis. As is well known, Col. S. G. Booker, superintendent of the company, has for some months been improving his facilities, and to-day the Phoenix Carbon Manufacturing company stands in the front rank of the carbon manufacturers. Colonel Booker recently brought out a dry battery for which an exceedingly long life is claimed. This battery has a number of novel features. The fundamental idea embodied in it is to maintain the excitant mixture in a moist condition and therefore active for a long period of time. Colonel Booker is an aggressive business man, and leaves no stone unturned in the development and improvement of his product. For years the name "Phoenix" has been synonymous with one of the very best grades of carbons manufactured, and, as a consequence, the "Phoenix" or "Progress" dry cell, as it is called, will without doubt meet with great demand from the users of dry batteries.

The American Electric Vehicle company is feeling much gratified over the success of its electrical carriages in general service. General Manager C. E. Corrigan of the company recently showed a letter to a representative of the Western Electrician that contained some rather interesting information as to what an electric carriage will do in general service. The letter was from B. F. Thurston, manager of the Mathieson Alkali Works, Niagara Falls. Mr. Thurston stated that he had "run the carriage something over 2,400 miles and have given it severe practical service. The carriage has not been used as a toy, but as a practical machine and has taken the place of two horses. Mechanically, I consider the outfit nearly perfect, and the only criticism I have to offer is in regard to the batteries. I think their mechanical feature can be improved, and I believe that you are now turning out a cell that will be more nearly perfect for vehicle-propelling purposes. I am more than satisfied with the carriage and cannot understand any one giving up the use of a motor carriage (of your make at least) when they have once owned one." Incidentally, Manager Corrigan announces that the contract and agreement between the American Electric Vehicle company and the Indiana Bicycle company, whereby the latter company undertook to build vehicles for the American company, was canceled October 4th, the American company reserving the right alone to build or sell American vehicles under the company's patents.

At the present time the abolition of tight belts has become a subject of such general importance as to require special consideration. For years the loss of power in transmission by belting has occupied the attention of the scientific and mechanical world. Belt dressings innumerable have been placed upon the market, but belts of all descriptions continued to slip whenever an effort was presented to run them slack. Engineers, who realize the tremendous loss of power every day and every hour in the day, must necessarily be interested in the product which not only allows belts to be run so slack that they almost touch, but also secures an increase of from 10 to 30 per cent. in power. It remained for the inventor of Cling-surface to produce an application which is so different from and so much more than a belt dressing, that it cannot be properly classified under that head. That instant recognition was given Cling-surface is attested by the marvelous growth of the trade, both domestic and foreign, of the Cling-surface Manufacturing company of Buffalo, since its inception three years ago. During three years the business has developed into one of large proportions, and the first year was devoted entirely to the purpose of a test, Cling-surface having been put into the hands of half a hundred manufacturers for trial. It was applied to every known kind of belts, under all sorts of conditions, and received unanimous approval. This great extension of trade has compelled the company

to remove from its former quarters to a new factory, affording facilities tenfold greater. Although the present factory is 10 times as large as the former establishment, all available space therein, including a spacious laboratory, is used for manufacturing the daily output. That the sphere of usefulness of Cling-surface is a large one is further attested by the fact that the output is being daily shipped to all parts of the globe, orders being received from South America, Europe, Asia, South Africa and Hawaii. Throughout the country Cling-surface is being widely used, and not a state in the Union but has borne testimonial to its worth. The Buffalo company has scores of unsolicited letters from some of the largest manufacturing, electrical and other power-using concerns in the United States, setting forth the benefit derived from the material, and testifying to the remarkable and permanent saving in power, in the life of the belts, and, consequently, decreasing to an appreciable extent the cost of power. And, furthermore, the sincerity of these testimonials is borne out by the fact that many duplicate orders have been and are being constantly received. The experience of the company has proved that when the compound is once correctly and properly used, its patronage from those users is assured. Practical men are aware of the fact that

nearly all steam and water power developed is transmitted by belting, therefore, that compound, which is so closely allied to the belting world, makes an interesting study in itself. What Cling-surface is and what it will do is best answered by the thousands of patrons who attest its worth. Cling-surface has proven that any and all belts upon which it is properly used will stop slipping, though the belts may be run so slack as to almost touch; that the power will be permanently increased to such an extent that the increase in a fair-sized plant will be worth far in excess of the cost of the material; that the belts, if they be of leather, will become as soft as calfskin, yet firm and flexible and also waterproof. These results are produced by this compound, which is of purely animal material, and was developed only after years of laboratory study and work by a technical chemist. Cling-surface is a material which is to be melted and applied with a brush to the inner surface of the belt, the operation being repeated often until the belt itself is filled. Then the fibers are surrounded and lubricated as though resting in oil bearings, and will remain so during the life of the belt, as Cling-Surface will not oxidize or rot, as grease, nor evaporate, as oil. In addition, this produces a softness, and at the same time a firmness and flexibility, which, besides pre-

venting slipping, precludes any cracking of the belt. This application further produces an absolutely waterproof belt, which is desirable in tropical countries, and even in the North where the atmosphere is humid, or in plants where steam and other moisture is prevalent. Besides this, an old oil-soaked or greasy belt can be restored to such a condition that it will transmit fully as much power as a new belt, thus making Cling-surface invaluable for the treatment of oily or greasy belts. To sum it all up, the surface of any belt used, whether leather, cotton, rubber or a rope drive, is made smooth and even by the use of the compound, and is neither sticky nor smeared, yet the belt clings, without adhering to the pulley face, making the slipping of the belt impossible. In short, there is no taking up of the belt, which necessitates stopping an entire plant, often when all hands are being rushed toward the completion of an important task. One of the first concerns to use Cling-surface was the Erie Railroad company at the Union drydocks in Buffalo, and the Erie officials assert that they have "saved the cost of taking up 500 belts in the last two years and a half." As all these results have been produced innumerable times, the Cling-surface Manufacturing company guarantees complete satisfaction with every pound of its output.

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued December 27, 1898.

- 616,507. Incandescent Electric-lamp Socket and Base. Christopher Van Deventer, New York, N. Y. Application filed April 1, 1898.

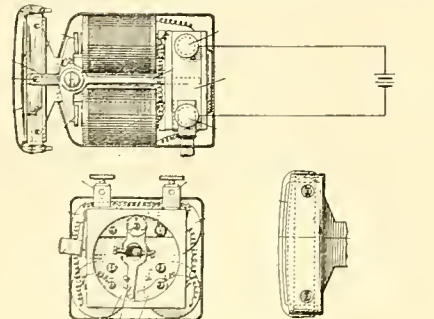
A terminal button on one side of the lamp base has a terminal at the end, an insulating casing having a hole for each of the terminals, respectively at the side and at the end, the terminals being those of the filament of the lamp, and terminals of the leading-in wires for the socket, attached within a given socket and respectively in contact with the filament terminals.

- 616,513. Apparatus for Making Observations by Means of Röntgen or X-rays. Jacques Wertheimer, Paris, France. Application filed November 19, 1897.

Two casings are employed, one of which is moveable toward and from the other, and a screen carried within one casing and a vacuum or fluorescent tube carried within the other casing; means are provided for supplying electric current for the tube carried within the moveable casing, a switch in the latter casing controlling the lighting of the tube, cords connected at one end with the switch and extending within the fixed casing and having fixed points of attachment for their opposite ends, and weights arranged to exert a tension upon the cords.

- 616,554. Razor. John F. O'Rourke, New York, N. Y. Application filed September 28, 1898.

The frame supports the razor-blade with freedom for longitudinal reciprocation, a pair of electro-magnets, a pivoted arm carrying the armatures of the magnets, a connection between the blade and the arm, and a vibrator to make and break the circuit through the magnets alternately.



NO. 616,554.

- 616,607. Support and Take-up Device for Cable-suspended Electric Lamps. John H. Dorion, Springfield, Mass. Application filed June 13, 1898.

A holder or clamp for a detachable, encircling, constrictive engagement about the shank of an electric-lamp socket is provided with two jaws adapted when open to leave an unobstructed opening for the entrance of an object, jaw-operating members and jaw-closing springs.

- 616,612. Armored Electric Cable. Edwin T. Greenfield, New York, N. Y. Application filed April 13, 1898.

A flexible armored electric cable consists of an insulated conductor having two or more metallic armor-strips spirally wound thereon and curved in opposite directions.

- 616,620. Electric Incandescent Lamp. Henry F. Joel and Ferdinand Fanta, London, England. Application filed July 29, 1896.

The globe employed is adapted by its shape to be blown in thin glass with resisting strength to external atmospheric pressure; a reflecting surface is carried thereby of parabolic or spheroidal form, and an incandescent filament within such reflector is bent into such a form from a continuous length to provide a body of several convolutions lying in a surface coaxial with and equidistant from the reflecting surface of all parts of the same, to produce a concentrated, uniform and directive light.

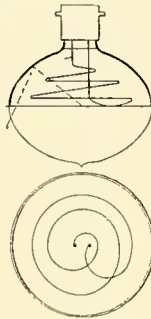
- 616,669. Recording Device for Measuring Instruments. Adrian H. Hoyt, Penacook, N. H. Application filed August 13, 1897.

A screw moves over a renewable scale, back and forth in the same plane, and traces, by the movement a line which by its length indicates the maximum reading of the instrument during a given time.

- 616,673. Electric Motor and Method of Controlling Same. Charles W. Kennedy, Rutledge, Pa. Application filed April 22, 1892.

The method described of controlling an electric motor consists in starting the motor at a two-pole machine with a set of field coils series with each other and subsequently changing it to a multipolar machine with all of the field

coils in parallel, and changing the internal resistance of the armature and maintaining the armature in balance uniformly around its axis.



NO. 616,620.

- 616,714. Automatic Telephone Exchange. Frank A. Lundquist, John Erickson and Charles J. Erickson, Lindsborg, Kan. Application filed March 28, 1893.

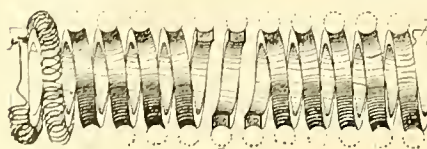
A switchboard and a number of contact points arranged thereupon, a longitudinally movable frame, circuit-closing devices carried thereby adapted to be moved into contact with the contact points, a ratchet bar carried by the frame, a pallet engaging the teeth of the ratchet bar, means for operating the pallet to move the frame, means for lifting the frame out of engagement with the pallet, and devices for returning the frame to its normal position.

- 616,718. Telephone Gravity Switch. Charles T. Mason, Sumter, S. C. Application filed May 3, 1898.

The gravity lever has a support for the receiver and a head or projection as well as means for lifting the gravity lever upwardly, and for electrically connecting the gravity lever to the same line terminal for both the ringing and talking circuits; two insulated contact springs are arranged on one side of the head of the lever to make electrical contact with the head when the receiver is off the lever and to press with a constant tension toward the head, one of the springs closing the primary and the other the secondary circuit through the lever, a fixed non-conducting rest block holding the springs insulated and in a definite position to the head of the gravity lever when the head is out of contact with the springs from the weight of the receiver on the lever, and another insulated contact spring arranged upon the opposite side of the head of the gravity lever and having a trend toward the head and a limited range of movement toward the same, to come in electrical contact with the head and close the ringing circuit when the receiver is on the lever.

- 616,722. Railway Signaling Device. Francis M. Myers, Windsor, Mo. Application filed April 2, 1898.

An electric conductor extends along a track, a series of signaling stations at separated points along the conductor, two or more trains adapted to travel upon the track, an electric-sounding signal upon each train in circuit with the conductor and adapted to transmit a number of different signals, and means for actuating the signaling device of each train as it passes a signaling station, whereby the signaling devices of all the trains upon the track are simultaneously operated.



NO. 616,800.

- 616,755. Binding-post for Electrical, Telephonic or Telegraphic Instruments. Joseph A. Williams, Cleveland, O. Application filed May 25, 1898.

This device comprises a plate, a saddle or bearing for the wire, a screw having a head or member overlapping the saddle, and a stop arranged to limit the inward movement of the screw.

- 616,770. Lighting or Extinguishing Automatically Incandescent Electric Lamps. Charles S. Cole and John H. Kinsman, Bridgeport, Conn. Application filed April 1, 1893.

Claim is made for the combination with the non-conducting casing of the conducting plate, a metallic clock supported thereon, the slotted conducting plates, the rotatable adjustable contacts, the transversely arranged switch car-

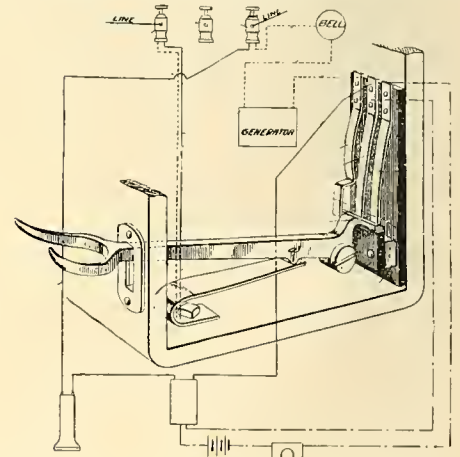
rying conducting strips, the pairs of contact blocks, the electromagnets and the electric circuits, including the plate and the clock, the balanced arm tube carrying an arm and a non-conducting segment provided with a conducting strip, oppositely extending separated conducting strips in the light circuit, and a rod extending through the front of the casing and forked at its inner end to engage the arm which projects upwardly from the armature.

- 616,779. Electrical Safety Lamp for Miners. Carl Francke, Berlin, Germany. Application filed April 18, 1898.

A lamp having a main and an auxiliary burner, a cap mounted to swing and to inclose one of the burners, and a switch controlling the circuits of the burners and having a stop-lug co-acting with the cap to prevent the further movement of the switch after the switch has been closed.

- 616,800. Electric Heater. James F. McElroy, Albany, N. Y. Application filed October 13, 1898.

An electric heater consists of a supporting helix and a resistance in the form of a compound helix arranged in continuous contact with each convolution of the supporting helix in such a manner that the spaces between the convolutions of the supporting helix shall register substantially with the spaces between corresponding convolutions of the resistance helix.



NO. 616,718.

- 616,824. Underground Electric-railway System. Frederick H. Chamberlain and Griffin B. Coleman, Washington, D. C. Application filed December 2, 1897.

The arrangement includes the motor current-collector and supply-conductors of an electric car, a plurality of interchangeable pairs of leads between the motor and supply-conductors connected to the current-collector, a switch for electrically connecting one or another of the pairs or sets of leads with the supply-conductor and electrical means for controlling the switch.

- 616,842. Automatic Regulator. Herbert E. Hunt, Pittsburg, Pa. Application filed January 26, 1897.

An automatic pressure regulator is described comprising an electromagnet, a pressure cylinder containing a piston and connected to the pressure reservoir, an admission valve therefor connected to and operated by the armature of the electromagnet, a rheostat having its contact-arm connected to the piston of the cylinder, and another pressure cylinder connected to the pressure reservoir and arranged to break connections to the motor when the pressure exceeds a certain determined amount.

- 616,861. Automatic Weighing Machine. Francis H. Richards, Hartford, Conn. Application filed December 10, 1897.

An electric circuit governs the movement of the valve and is controlled by a make-and-break wheel, and an electrical circuit controller is governed by the weighing mechanism and controls the rotation of the make-and-break wheel.

- 616,864. Automatic Weighing Machine. Francis H. Richards, Hartford, Conn. Application filed December 11, 1897.

Electric circuits control the movements of the valve mechanism; a circuit controller is governed by the weighing mechanism and shiftable onto the contact terminals successively during the descent of the weighing mechanism, and a counterpoised switchback for shifting the circuit controller out of its normal path of travel during the ascent of the weighing mechanism.

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No. 2

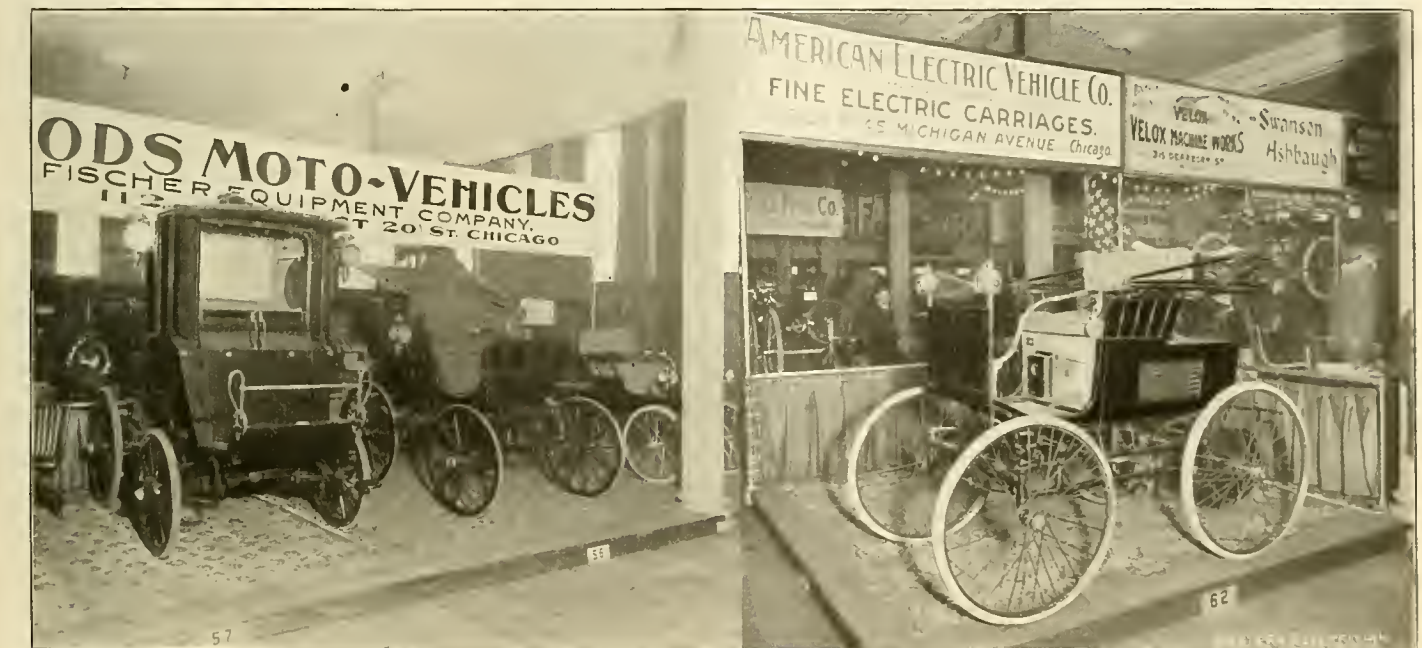
Automobile Vehicles at the Cycle Show.

This year's cycle show in Chicago bears the amplified name of cycle and automobile show and contains three exhibits of horseless carriages. One is a Hertel road wagon, equipped with a $2\frac{1}{2}$ horse power gasoline engine and built by the Oakman Motor Vehicle company of Greenfield, Mass. The others consist of electric vehicles for pleasure riding, four of which are shown in the accompanying illustrations.

The Hertel motor carriage is a small open vehicle with a seat for two passengers. The engine, gasoline and water tanks are under the seat. The outfit is said to weigh but 500 pounds and to have a range of 30 miles on one gallon of gasoline. The maximum speed is stated to be 30 miles an hour. The vehicle has the characteristic merits and disadvantages of the gasoline moto-cycles—semi-independence of operation at the cost of some heat, odor and noise.

The Fischer Equipment company of Chicago ex-

hibits four electric carriages, three of which are shown in the left-hand picture. They are of the type developed by Mr. C. E. Woods. The vehicle on the left in the picture is a hansom cab; in the middle of the exhibit space stands a stanhope, and a light road wagon is on the right. All of the exhibits are finely finished and upholstered and carry electric lights and loud-sounding electric gongs. The hansom and stanhope have each two independent motors on the rear axle and the smaller road wagon has but one. Each vehicle has 40 cells of battery. The weights of the complete vehicles are as follows: Hansom, 2,600 pounds; stanhope, 1,500 pounds; road wagon, 775 pounds. The heavy cab has two $\frac{3}{4}$ horse power motors, the stanhope two of $2\frac{1}{4}$ horse power each, and the one motor of the road wagon is rated at $2\frac{1}{4}$ horse power. The cab has a maximum speed of 12 miles an hour and is stated to run 30 miles on one battery charge; the figures in the case of the stanhope are 14 and 25 miles, respectively, and for the road wagon 14 and 20. Each vehicle is equipped with voltmeter and ammeter to show the state of the battery. The smallest vehicle has pneumatic tires; the others have solid-rubber tires.



AUTOMOBILE VEHICLES AT THE CYCLE SHOW.

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On the second floor of the building used for the show is an open space in which the automobiles are shown in motion. Here the Fischer company has a two-seated park break in which its friends are given free rides. The break weighs 1,800 pounds, has two motors, a maximum hourly speed of 14 miles and a stated range of 25 miles on one charge of the battery.

The electric runabout buggy shown in the right-hand picture above is exhibited by the American Electric Vehicle company of Chicago. It is equipped

with 44 cells of battery and one single-reduction motor of about $3\frac{1}{2}$ horse power, with hollow armature shaft, attached to the rear axle. Differential gearing is provided, so that the rear wheels may be driven at different speeds in turning corners. The motor and all gears are completely enclosed, to be dust and waterproof. A hand brake, arranged to be operated by foot pressure of the driver, is provided on the motor shaft. In addition arrangement is made for a quick emergency stop by reversing the motor. The vehicle is equipped with an automatic cut-off device in the battery-charging circuit, so that the current is cut off without supervision when the battery is charged. A recording wattmeter is placed in a conspicuous position, so that the driver may be cognizant of the condition of the battery at all times. The buggy weighs about 1,100 pounds and has solid-rubber tires. It has a maximum speed of 15 miles an hour and is said to be capable of covering 35 miles on one battery charge. This vehicle is of the older type made by

the company and has been in actual service for some time. It is said to have covered at least 3,000 miles on Chicago streets. The framework is of steel tubing, but in the newer models the carriage-builder's style of running-gear is adopted. The American company has a buggy similar to the one illustrated in operation on the upper floor.

Visitors at the show examine the automobile vehicles with much interest and attention, and their intelligent questions show that the new vehicles are no longer regarded as novelties, but rather as serviceable products.

Telegraph Tolls in Kansas.

The bill reducing telegraph tolls in Kansas makes at least a 40 per cent. cut in the present rates. It provides that the charge for a 10-word day message shall not exceed 15 cents between points within the state, "and no person, company or corporation shall demand, charge or receive for any distance between points within this state more than one-third of one cent for each word for messages of over 10 words received between the hours of 6 o'clock a. m. and 6 o'clock p. m., and one-sixth of one cent per word for messages received between the hours of 6 o'clock p. m. and 6 o'clock a. m., to be transmitted as special reports for newspapers." For refusing to deliver messages or for divulging the contents of messages a heavy fine is imposed on the managers or agents. Telegraph companies are classed among the corporations which are placed under the control of the new Court of Visitation. This court is charged with the duty of bringing action against such companies in case of failure to comply with the law.

Electrical Trade with Cuba.

[Special correspondence of the Western Electrician.]

Washington, January 9.—Under the recently amended tariff for Cuba, the landing charge of \$1 per ton, on both imports and exports, has been abolished. The port of Havana is designated as the principal customs port of the island, with the following named sub-ports: Matanzas, Cardenas, Cienfuegos, Sagua, Caibarien, Santiago, Manzanillo, Neuvas, Guantanamo, Gibara, Baracoa, Trinidad, Santa Cruz, Zaza and Batabano.

Among the rules laid down for the classification of articles for duty it is provided that if an article presented for entry is not enumerated in the tariff, the customs authorities may be called upon to designate the number under which it shall be classified, and clearance shall be effected according to that designation. If an article is composed of two or more materials or of different parts, it shall be taxed for the total weight, according to the component

material of chief value, and if this is a subject of doubt, then it shall be according to the most highly taxed of the component materials, and if it is proved that a mixture of different materials has been made for the purpose of evading the payment of any specified duty, the highest rate of duty shall always be collected.

Under the provisions of the tariff the following duties are levied:

Electric insulators, \$1 per 100 kilogrammes, gross weight, with a tare allowance of 20 per cent.

Incandescent electric lamps, mounted or not, \$2.50 per 100.

Conduits of clay, cement or stoneware, glazed or unglazed, 50 cents per 100 kilogrammes, gross weight.

Cables, wire, \$1 per 100 kilogrammes, gross weight.

Wire covered with tissue or insulating materials, conducting cables for electricity over public thoroughfares, \$7.50 per 100 kilogrammes, gross weight, subject to a tare allowance of 20 per cent. (By conducting cables for electricity are meant cables composed of one or more wires of copper or any alloy of copper, whatever may be their thickness, provided that they are covered with an insulating wrapper, without taking into consideration whether they are enclosed in pipes of iron or lead, or strengthened with cordage or iron or steel wire.)

Carbons, prepared for electric lighting, \$3 per 100 kilogrammes, gross weight.

Dynamo-electric machines, exceeding 50 kilogrammes in weight, 20 per cent. ad valorem.

Dynamo-electric machines, weighing 50 kilogrammes or less, inductors and detached parts, 20 per cent. ad valorem.

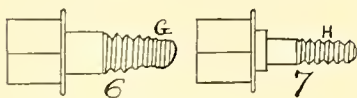
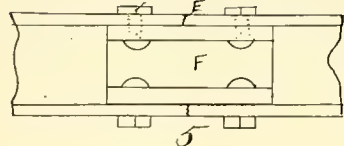
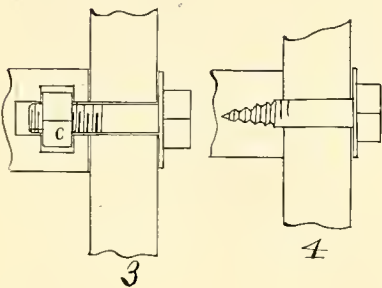
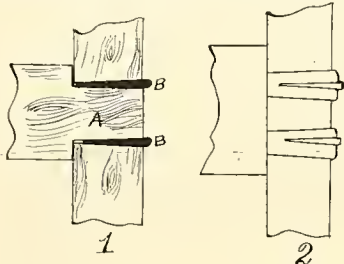
A. F. T.

Mechanical Topics for Electrical Men.

By B. F. FELLO.

Useful forms of making wood connections in the construction of switchboards and kindred work are shown in Figs. 1, 2, 3 and 4. The method illustrated in Fig. 1 is used by many who desire to do away with set-screws, bolts, connections or metal joints of any description. It consists in mortising the body or ground piece, and the tenon is wedged in by means of the V-shaped pieces of hardwood B B. The joint is made tight without packing of any sort, and if correctly put together makes a strong union. A plan for double-split wedgings is shown in Fig. 2, in which the tenons are divided and the wedges driven firmly into place, as shown. This type of joint is considered more durable than the former and is especially useful for making fastenings on switchboards. The design of jointing represented by Fig. 3 is effected with a bolt and nut. The body piece is bored straight for the bolt, and the joint is made by cutting a cavity in the second piece, as shown at C. The nut is prevented from turning by the sides of the cavity, so that, by turning the bolt-head, the pieces may be drawn together and secured with great firmness.

The method presented in Fig. 4 is open to criticism, as the threads of the screw are liable to become worn and lose their grip on the wood, or, if the hole for receiving the screw is a little too large, the heads may not take hold at all, resulting in the



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MECHANICAL TOPICS FOR ELECTRICAL MEN.

loosening of the whole affair. When this method is used, therefore, care should be taken that the crew hole is bored the right size to afford the threads a firm grip the entire length of the screw.

REPAIRING A BROKEN TUBE.

In a recent piece of electrical work which came to the notice of the writer, one of the tubes of the frame of the machine was broken off, as shown in the illustration at E, Fig. 5. The process by which this fractured tube was joined may be interesting. First, a piece of steel tubing of smaller diameter was obtained and fitted into the main tube, midway with the break, as at F. Then a number of rivet holes were drilled around the tube and rivets inserted and headed up, as shown. The joint was then smoothed over with a file, and is now very strong.

KEEPING WORN SCREWS IN SERVICE.

There are a number of sizes and kinds of cap, box and set-screws in use on electrical machinery, and some of these screws are hard to replace when once destroyed.

Suppose that a screw is broken or worn down at the threads, as at G, Fig. 6. Such a screw is useless in its present condition, and a machine may be standing idle for lack of a new screw to replace the defective one. In such a case as this, it is a good

plan to put the screw in the lathe and turn it down to a shoulder, as at H, Fig. 7, thus making a new screw, so far as the threads are concerned, from the old screw.

FIXING A BROKEN LEVER.

A short time ago an important electrical machine was put out of service because a lever arm was broken off short, as at A, Fig. 8. As another arm could not be had for several days, and as it was necessary that the machine be kept running, the lever was repaired by first filing down the sides near the stubs of the break and then fitting pieces of sheet metal B into these places. After getting the parts fitted, they were wired, and holes for the rivets drilled. After riveting, the wire was taken off, the edges of the patches filed down even, and that lever is now running in good form.

WRAPPING A SPLIT HUB.

When a hub of a lever breaks or splits, as at C C, Fig. 9, a good way to repair it is to wrap the hub with sheet metal shaped to correspond with its outlines. Usually, it is the pressure of the set-screw D that splits the hub, and provision must be made with the new wrapping to overcome the pressure. If the metal wrapping is lapped completely around the hub and brought up to the shank on either side, rivets can be put in at E and F, and a practical job produced.

ADJUSTING COGS.

If a cog breaks off from a straight or beveled gear in an electrical machine, the gear should, by all means, be replaced with a new one. But it may be that the old gear will have to be patched up, owing to there being no extra ones on hand. A practical mode is to cut out the seat of the broken or worn cog and dovetail in a new tooth, as suggested in Fig. 10, in section. When this method is employed, a good plan to secure the cog in position is to use one or more set-screws G, which may pass through the gear rim and up into the seat of the cog. In some cases it may be wise to use cogs of the pattern shown in Fig. 11. This type requires a larger seat in the gear rim and calls for more cutting and filing of metal. But when the cog is in place and firmly secured it may be relied upon.

CRACKED CYLINDER FLANGES.

Fig. 12 shows a way to rectify the broken flange of a cylinder. If the flange is broken at J, which is usually caused by the pressure from the key H, the flange can be grooved out all around and the wrought-iron ring slipped into the groove and secured with pins, as marked I. This ring will hold the parts securely and make the flange as good as new. Another way consists in slipping on a set-screw collar L, as shown at K, where the cylinder is cracked at K. All that is necessary is to obtain a collar the right diameter and, after slipping it on, screw it tight. This collar will not be in the way and it will be adjustable.

Progress in Submarine Boat Building.

French naval officers are working energetically for the perfection of submarine-boat operation, primarily for the purpose of providing an effective method of making torpedo attacks. These experiments are watched with much interest in this country, where recent trials have been made of the submarine boat Holland, near New York, and where the Plunger, of the same type, is nearly ready for test at Baltimore. Both the American and foreign boats are electrically driven from storage batteries when submerged.

France has given more official encouragement to this development than any other nation. Lieutenant Darcus, of the navy of that country, has been promoted to the grade of commander and assigned to the position of chief of the military cabinet of the Ministry of Marine. His promotion was due to the great success which has attended his efforts during the last eight years in the study of under-water navigation. Largely as the result of his labors, six submarine torpedo boats are provided for in the French naval budget of 1899. Full details concerning them have not been given out, but the following information is obtained:

These boats, which are to be laid down in the various arsenals, are of the following dimensions: Displacement, 106 tons; length, 111 feet; breadth, 12 feet; maximum draught aft, five feet, and horse power, 217, which, operating a single screw, will drive the vessel 12 knots on the surface. They will carry four sets of torpedo-launching apparatus.

These vessels are identical with the Narval, now constructing at Cherbourg. They have a steaming radius on the surface of 250 knots, and their under-water radius at 10 knots speed is 100 miles. The French naval authorities have so much confidence in them that the present intention is to lay down a great many more of them, but probably not until after the Narval has completed her trials, so there may be an opportunity to improve the new boats.

The vessels are propelled by steam power when on the surface and by electric accumulators when beneath the surface. This electrical accumulator can be charged with the vessels' own dynamo. The confidence in these new boats arises from the success of the Zélic, referred to in the Western Electrician of last week. This latter boat is now at Toulon, where she has been, during the last two years, undergoing important modifications. Her propelling force is wholly electric, and her speed under water is 15 knots. She has recently made the trip under

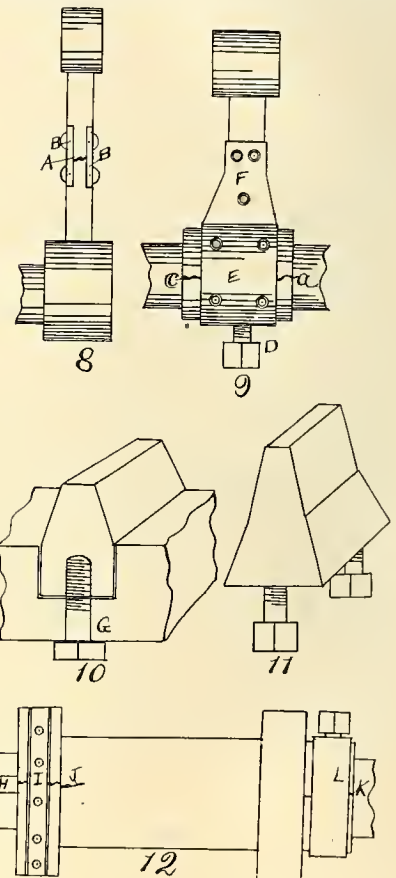
water from Toulon to Salins d'Hyeres and return, a distance of about 40 miles. She was accompanied by a sea-going torpedo-boat, which carried the board of inspection.

It is claimed that a submarine boat has repeatedly passed the blockading squadron off Toulon and entered the harbor without discovery. French officers are of the opinion that they have solved the problem, and this affords them much satisfaction in view of the importance which they attach to it in connection with the naval defenses of their ports.

Boom in Copper Market.

Houghton, Mich., January 9.—An illustration of present condition of the copper market is found in the experience of the Michigan Copper company, which is in process of reorganization. Where call was made for but \$1,000,000, almost \$7,000,000 has been subscribed. The old Michigan (or Minnesota) mine paid dividends of \$1,820,000 and was abandoned by stockholders, who refused to put up \$50,000, after receiving dividends of nearly \$2,000,000, 25 years ago. The mine was pushed too hard, every dollar taken out was devoted to dividends, and the time came when new machinery was required, new ground was to be opened, and there was no money in sight to do the work. It is generally believed that the Michigan will resume its place among the great mines of Lake Superior.

The Union Land and Copper company, which so successfully launched the Old Colony, with Saint



WESTERN ELECTRICIAN

MECHANICAL TOPICS FOR ELECTRICAL MEN.

Marie's Canal Mineral Land company, has plans under consideration for launching several other new mines.

The Mendota, on Keweenaw Point, is to be reopened. The ore is found in true fissure veins, traversing the copper-bearing formation at almost right angles. The ore is a gray sulphuret, free from antimony and arsenic, and therefore capable of reduction by simple smelting. It is necessary to reduce most of the Montana ore by electrolysis, on account of the considerable quantities of arsenic and antimony, both highly refractory in furnace.

There seems no longer a question that the Standard Oil people are in copper mining to a considerable extent, though they are not showing their hand. It is certain that the Calumet and Hecla, Quincy and Canal company people have been approached and have refused to go into the proposed consolidation. Whether the Bigelow-Lewisohn interests, heretofore the dominant factor in American copper matters, have been swallowed by the Standard Oil combination, or have themselves swallowed the other factors, is problematical.

[From the New York Sun.]

Over in Boston they have gone daft over copper. Men there with money to invest want to buy copper stocks only. They talk copper all day, think about it all the evening, and dream about it all night. It may be that not all those in Boston who are falling over one another in the effort to acquire copper

stocks are wise speculators. There are some, perhaps, who would say that the stock of a copper mine, which was put on the market last summer at \$8 a share and which is quoted to-day at about \$50 a share, in the face of the fact that the mine has not produced a pound of copper, may have a fictitious value. However that may be, it is true, nevertheless, that there has not been a time in years when the demand for copper was as large as it is now, and those who should know say that not in years have the visible stocks at the mines been so low.

The reason that Boston appears to have a monopoly in the trading in copper shares is that Boston is the home market of the United States for copper. So far as eastern capital is concerned, moneyed men in Boston invested in copper long before financiers in any other eastern city took very much interest in that particular metal. The result is that if anyone wants to trade in copper he does it through the Boston Stock Exchange.

The chief reason for the increased demand for copper is to be found in the increased uses to which electricity has been put in the past year and a half or two years. It is impossible to use electricity commercially without using copper. Copper is electricity's great conductor. To furnish electric power, heat or light, copper wire must be used to transmit the current. When it is remembered that within the last two years the demand for electricity for lighting, for heating and for power has been little short of marvellous, some notion may be obtained of what the demand, during this time, has been for copper.

For several years the United States has controlled the copper markets of the world. Outside the United States the principal copper fields are in Chile and in Spain. The Chilean copper mines are controlled by English capitalists. It was the practice of the operators of the mines in Chile to sell their product for pounds sterling and to pay the workers in the mines in Chilean money. When the men refused to receive their pay in a depreciated currency it was no longer possible to operate the mines at a profit, and since then the copper industry in Chile has been comparatively dead.

The Spanish copper mines are great producers, particularly the Rio Tinto mine, which is the largest producer of copper in the world. In fact, copper at the Rio Tinto is really a by-product. The copper there is found in combination with sulphur, which is also produced in great quantities. In extracting the sulphur by fire the copper is left as a residue.

In the United States the sources of copper are the mines of Montana and Arizona and those along the shores of Lake Superior. The Anaconda mine in Montana is the largest producer of copper in the United States, and, with the exception of the Rio Tinto, the largest producer in the world. The Anaconda is controlled by J. B. Haggin and Marcus Daly, both of whom are as well known on the turf as they are in the copper industry. The shares of the mine not held or controlled by Haggin and Daly are controlled by English capital. Other large mines in Montana are the Boston and Montana and Butte and Boston, controlled by Albert S. Bigelow of Boston. In Arizona there is the United Verde mine, owned by William A. Clark, known as a miner and banker in Montana and as an art connoisseur and collector of pictures in New York. Other mines in Montana are the Copper Queen, the Detroit and the United Globe, controlled by Phelps, Dodge & Co. of New York. All the copper from the Montana and Arizona mines must be separated from the ore by chemical processes.

It is especially in reference to the way in which the copper is obtained from the ore that the Lake Superior mines differ from all other mines in the United States. The copper from all the Lake Superior mines is what is known as pure copper. In other words, all that is necessary to do to obtain the copper from these mines is to crush the ore and pick out the copper. Those who should know say that the copper obtained from the Lake Superior mines is the best copper in the world, because it is the best conductor of electricity. It is for this reason, it is said, that the Lake Superior copper brings a higher price in the market than the copper from any other mines.

The best known, probably, of the Lake Superior mines is the Calumet and Hecla. The company controlling this mine is made up largely of Boston capitalists, and its president is Alexander Agassiz of Boston, the son of the great naturalist. In fact, Mr. Agassiz discovered the mine. It was in 1865 that Mr. Agassiz went to Lake Superior to investigate the copper deposits. While there he found the vein of the Calumet and Hecla. He saw that it was immensely rich, and after a time returned to Boston to form a company to operate it. He associated with him some of the best-known men in Boston, including Hollis H. Hunnewell and Quincy Adams Shaw. Mr. Agassiz became superintendent of the company in 1869, and served in that capacity until he was elected president. This mine has proved to be the richest copper mine in the world, and has made everybody connected with it rich.

Other mines in the Lake Superior region are those included in what is known as the John Stanton group—the Atlantic, Baltic, Wolverine, Mohawk and Winona. The Bigelow interests own the Tamarack and the company controlling the Osceola Consolidated controls a number of good mines. Perhaps the mine that is attracting the most attention just now of all those along Lake Superior

is the Arcadian. Interest attaches to this mine because common report has it that the Rockefellers are its chief owners. A great amount of money has been spent in the development of the mine, and the latest improvements in copper-mining machinery have been installed there. The gossip among the men interested in copper is that the Standard Oil company purposes to interest itself in copper almost as heavily as it has in oil.

These are the principal mines in the United States to contribute to the world's supply of copper. In proof of the fact that the United States controls the copper market, it may be stated that we furnish about 60 per cent. of the entire product of the world. In 1897 the world's product was 412,050 tons. Of this amount the United States furnished 277,000 tons. Up to November 30th of this year the output of copper in the United States for 1898 was 215,700 tons, or 17,818 tons more than in 1897. The statisticians figure that this is an increase of 9.4 per cent. The exports up to November 30th amounted to 131,893 tons. In this amount, however, is included the product of the Boleo mine in Mexico. Taking this out, it is figured that the export of copper from the United States in 1898 over 1897 was somewhere about 5,500 tons, which is an increase of 4.7 per cent. The increase in home consumption was about 12,300 tons.

Those who know are not willing to give out the exact figures, but approximately the relative monthly output of copper mines in the United States is as follows:

Montana mines.....	17,000,000 pounds
Lake Superior mines.....	12,000,000 pounds
Arizona mines.....	10,500,000 pounds

This output bids fair to be greatly increased

United States in regard to an arrangement of copper interest, are being watched in Paris with the greatest interest.

A prominent financier, who is considered the highest authority in France on matters pertaining to the copper market, being questioned as to everything on the subject, said:

"The Rothschilds are believed to have increased their holdings of copper securities recently, but there is no probability whatever of their using their influence to further the alleged copper combine, and it is safe to say the Rothschilds, together with all French copper interests, would do all they could to oppose any movement like that of the famous Secretan copper corner, which had such a disastrous reaction in Paris some ten years ago.

"If, however, the present movement in the United States is merely to regulate the supply on the lines which the Standard Oil people have treated petroleum, and not aiming at corners or inflation of prices, it is believed the market here would favor and perhaps co-operate with it.

"There is an unusual demand for the purest electrolytic copper for electrical construction work. The world's supply of this material for 1897 was only 160,000 tons, of which 130,000 tons came from America. The present price of standard copper, \$300 a ton of 2,240 pounds, is considered remunerative and satisfactory to producers, and, if maintained, it will likely bring numerous partially developed or silent mines, which exist in Tasmania, Norway, and all over the world, into the list of producers, and thereby cheapen the price of copper.

"These considerations are sufficient to prevent clear-headed capitalists, whether in France or the United States, from attempting to push any amal-



ELECTRIC WIRES IN A STORM.

during the next year. The demand for copper has resulted in the development of a great many copper properties that have been lying undeveloped for years and in the prospecting for new properties. It is said that in the Lake Superior region alone during the past few months the development of not less than a dozen mines has begun. Of course, this work would not have been undertaken had the price of copper during the past year not led men to believe that the high price would be maintained or increased. Whether this shall prove true or not depends upon the future demand, but it does appear to be true that the visible stocks at the mines are pretty well cleaned up, and it is said that the visible supply of the world, were it not to be increased, would not last much longer than about 30 days.

Some idea of the basis of the copper men's figuring may be obtained by a consideration of the average price of copper during the past year. Here are the figures:

The average price for January was 10.90 cents a pound; February, 12.28 cents; March, 11.08; April, 12.14; May, 12; June, 11.89; July, 11.03; August, 11.89; September, 12.31; October, 12.41; November, 12.86. During the last week Lake copper has been quoted at 13 cents, and other coppers at from 12¹/₂ to 12³/₄ cents a pound.

[Special cable to the New York Tribune.]

Paris, January 7.—Considerable credence has been attached in Paris, which is the most active market in Europe for refined copper, to reports that the Messrs. Rothschild, who have large interests in Spanish Rio Tintos and other copper mines, were disposed to enter into communication with the Standard Oil trust to secure control of the principal copper-producing mines of the world.

The price of standard copper in the last 12 months has advanced \$45 a ton, and on the Paris bourse yesterday and to-day there was a sudden rise of from \$3 to \$6 in quotations of standard copper and leading copper-producing mines.

The alleged movements, which, according to cable accounts published here, are being made in the

gamation schemes to a point which would cause a corner or monopoly."

Electric Wires in a Storm.

The effect of severe storms upon overhead electric picture of the wreck produced by a recent storm picture of the wreck produced by a recent storm at Hamilton, Ont. The work of destruction, as shown in the photograph, is about as complete as could well be imagined. There is no claim that the construction was poor; it was probably of the same class that is generally found in cities of that size; and, aside from the danger to passers-by, the loss entailed must dispose the management of the electric companies interested to serious reflection upon the advisability of burying all electrical conductors.

Electric Railway in Ireland.

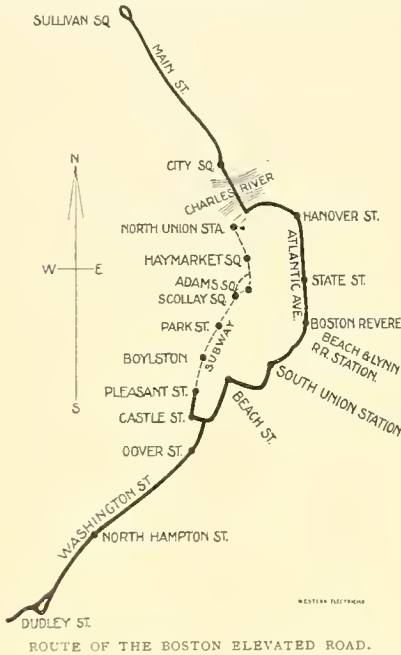
The city of Cork is now, for the first time in its history, enjoying genuine rapid transit, says the correspondent of the Chicago Record in that city. The electric tramways, upon which work has been in progress for several months, have been completed and are in operation. They were built by a private company under a contract by the terms of which the city will be able to purchase the plant on equitable conditions. The power house is situated in Albert street, near the river. All the equipments in the way of boilers, feed and condensing pumps, engines, batteries, switchboards and cables are of the latest and best designs. Double tracks have been laid through the principal streets; the branch lines run to Tivoli, St. Luke's, Western road, Blackpool and Douglas. The longest branch is to Douglas, a village about two miles south of Cork. The tramway crosses the river twice—first over Parnell bridge, a steel swing bridge, and the second time over Patrick's bridge, which is built of stone. The rails in the city are laid on a bed of concrete, and the roadway is paved between the rails and 18 inches outside. Center poles with double bracket arms are

used in the principal streets. Side poles with single-bracket arms are used on the rest of the line. The cars used are of the double-decked or "top-seat" pattern, each being capable of seating 18 passengers. At present, on all lines but one, they are run at 10-minute intervals.

Route of Boston Elevated Road.

Ground has been broken in Sullivan Square, Bunker Hill district, for Boston's new elevated road. This is the beginning of an enterprise that promises much for the Hub and its suburbs. The motive power for the elevated system, like that for the existing surface system of the company, will be electricity, but the overhead road will be run on the third-rail principle, while the trolley will be retained for surface cars. A feature of the construction will be the location of the third rail. Most of the elevated structure will be double tracked, and the power rails will be between the north-bound and south-bound tracks, where passengers will be least likely to get into the danger of contact with them through carelessness or accident, the third rail for each track being on the left of the car and about two feet from the left-side rail, while exit and entrance will be effected on the right-hand side. At switches, however, it will be necessary to take a contact for a short distance on the outer, or right-hand, side of the track, and at such points a third rail will be provided for that especial purpose. There will be four shoes pendant from the motor car, two on each side, so situated that it will be possible to make a contact either to the right or to the left with a shoe, thereby obviating all danger of a train being left without power on crossing a switch.

The first section will run through the heart



ROUTE OF THE BOSTON ELEVATED ROAD.

of the city, utilizing the subway for a portion of the line, and the round trip from Sullivan Square to Dudley street, in the Roxbury district, will be about 10 miles. The route selected is shown on the accompanying map. Branch lines to other outlying suburbs will be built later on, and the work is to be completed in about two years.

Repairing the Lightning Rod on St. Peter's Cathedral.

It will doubtless be a surprise to many persons to learn that St. Peter's cathedral in Rome is equipped with a lightning rod, yet a recent article by Dr. Albert Battandier in Cosmos of Paris (translated for the Literary Digest) shows that such is the case. It seems that two years ago Father Lais, taking advantage of the repairs that were in progress on what is called the ball of St. Peter's, that is, the globe, mounted by a cross, that tops the great dome, which, in his capacity of director of the Leonie Observatory, to make use of the scaffolding that had been erected to examine the point of the lightning rod. His inspection was not unnecessary, for he found that the metallic cable was not continuous and was not properly connected. After having verified this in person, he gave orders to change the point of the rod, substituting for the single terminal a multiple one formed like a plume. Further investigation showed that the rod ended in a hole filled with wax and grease. Father Lais rectified the end of the rod, and since a lubricant was thought to be necessary, he replaced the tallow by graphite. The picture shows the scaffolding about the globe, and the lightning rod which surmounts the dome. It is a reproduction of a photograph taken with a telephoto objective.

The author of the article in Cosmos adds these interesting particulars: The bronze globe, which is 16 inches in diameter (7 1/2 feet in circumference) is fixed to a iron tower 100 feet in an

angle of 90°, through which tourists may observe the landscape. A legend tells that during the earthquake of February 2, 1703, two persons were in this globe. The globe swayed frightfully, on account of its great height from the ground, and the persons in it were so overcome with the fear of death that, by a phenomenon that is by no means rare, they really did die, and their bodies were found in the globe. The cross (above the globe) is three meters (nearly 10 feet) in height, and each transverse arm is a meter (3/4 feet) long. From this cross rises the lightning rod, which can be seen in the center of the scaffolding. The rod rises three meters above the top of the cross. The men standing on the scaffolding show the height of its different parts and give an idea of the size of the pieces of wood used in its construction."

Electrical Trade in Argentina.

By C. PAULO REI.

In Buenos Ayres electrical work has, inside of the last four years, advanced to a greater degree than in Rio de Janeiro, Valparaiso, Montevideo or any other city or town in South America. Since 1895 the increase in the use of electricity as a motive power and for lighting purposes throughout the entire republic has been phenomenal.

In 1895 the entire imports of dynamos, galvanized-iron wire, electric-light cable and wire, incandescent lamps, other electrical apparatus and materials for telephones and telegraphs amounted to \$625,814 gold; in 1896 they increased to \$1,319,220; in 1897 they still further increased to \$1,563,583, and for the nine months ended September 30, 1898, they were \$2,035,208.

Although the United States secures a large share of the electrical trade, Germany makes a better showing in the import figures, largely due to the immense quantities of galvanized-iron wire that are purchased there annually by Argentina.

The import statistics here given show the relative positions of the several countries engaged in the trade:

	1895.	1896.	1897.	9 mos. of 1898 to Sept. 30th
Germany.....	\$131,919	\$467,991	\$561,396	about \$610,000
Belgium.....	256,834	284,921	254,323	" 250,000
United Kingdom...	126,972	290,714	299,912	" 310,000
United States.....	91,318	258,408	417,530	" 785,000
France.....	13,455	14,952	25,585	" 78,000
Italy.....	5,316	4,234	1,897	" 2,000

As is seen, the imports from the United States during the first nine months of 1898 increased to an enormous degree, and American firms are now supplying by far the greater percentage of electric-light materials, cables and wire, incandescent lamps, fittings for lamps, etc., that are entering the republic. Germany continues to supply the greater portion of the galvanized-iron wire.

A great portion of the machinery for the large lighting and power plants that have been established in Buenos Ayres is of American manufacture, although German companies represented in Buenos Ayres have not only sold quite an amount of electrical machinery, but have erected and are working an electric-light and power station. Through the interior also, the Germans have been successful in introducing their machinery. At Salto, Banda Oriental, they have established a lighting plant, with a capacity of 4,000 16 candle power lamps, as well as small installations in Brigado and San Fernando.

The most of the equipment necessary for the United River Plate Telephone company, the Co-operative Telephone company and the National Telegraph Department has been furnished by English concerns, such as the India Rubber, Gutterpercha and Telegraph Works company, Limited, of London, W. T. Henley Telegraph Works company, Limited, and the British Insulated Wire company, all of which have agents in Buenos Ayres.

The River Plate Electric Light and Traction company, with head offices in London, has the most complete central station (9,600 horse power and electrical capacity of 6,000 kilowatts) in South America, as well as smaller stations in Rosario, Tucuman and La Plata. This company, in addition to supplying light and power from stations in the cities mentioned, has also installed complete plants for private lighting and traction companies. A large share of the machinery installed by it is of American manufacture, although quite an amount is purchased in England. The equipment necessary for the central station in Buenos Ayres is of American manufacture, but for the other stations, in Rosario, Tucuman and La Plata, English machinery was purchased.

During June, 1898, the German Electric Light and Traction company came into being in Buenos Ayres, with a capital of \$5,000,000 gold, immediately purchasing outright the old horse-car lines of the Metropolitan and Grand National Tramways companies, and it is now engaged in changing them into electric lines. This company is fighting the English companies tooth and nail, and is doing its utmost to oust the River Plate Electric Light and Traction company from Rosario, and in all probability it will succeed, as the English company has of late been giving very poor service there, and many complaints have been made.

The German management is very aggressive, and should it be successful in injuring the business of the English companies, American interests may also suffer, as a large portion of the machinery installed by the English companies comes from America,

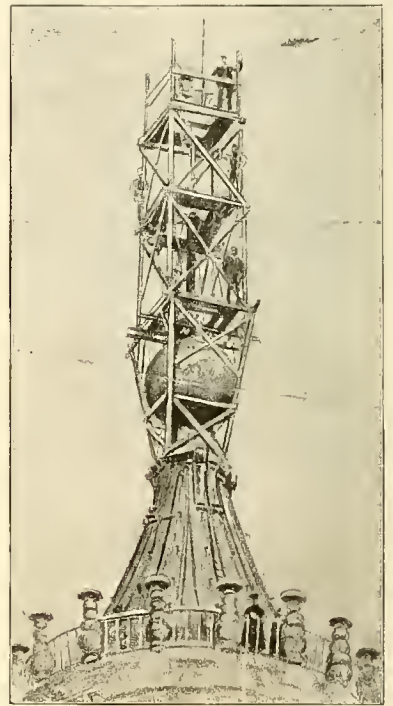
whereas the Germans would not purchase American apparatus. It is learned that the German company has just purchased a controlling block of shares of the stock of the Anglo-Argentine Tramways company, so it can be taken for granted that it will also alter that company's system to electric traction.

The first electric tram line established in Buenos Ayres, and in Argentina, was that of the Buenos Ayres and Belgrano Tramway company, which ran its first electric car over the route on April 22, 1897.

This work was carried out by Charles Bright & Co. (now the Bright Electric Light and Power company, Limited, with a capital of \$1,000,000 gold), the largest electrical engineer and contractor in Buenos Ayres, and the most of the material employed came from the General Electric company.

The "La Capital" electric tramway, the second electric railway in Buenos Ayres, was opened to the public on December 4, 1897. The steel power house was built by the Berlin Iron Bridge company, the entire rolling stock by the J. G. Brill company; the iron poles were supplied by Morris, Tasker & Co., the overhead appliances by the H. W. Johns company; the three vertical engines are Ball & Wood, of 450 horse power each, directly coupled to 300-kilowatt Walker generators; so it is seen that American manufacturers benefited considerably by the construction of this line.

The plant, which was first established by Rufino Varela & Co., was taken over by a concern formed in Paris, the Cie Generale d'Electricite de la Ville de Buenos Ayres (capitalized at 6,000,000 francs), which then established a large light and power station in the Retiro portion of the city. In August,



REPAIRING THE LIGHTNING ROD ON ST. PETER'S CATHEDRAL.

1898, the company obtained a two-year contract for the public lighting of the city. This company is also making active warfare against the English companies, but not to the same extent as the German companies.

The Primitiva Gas and Electric Light company is another large English concern which largely employs American machinery and materials.

Small lighting plants in which American machinery is employed have recently been established in Cordoba, Bahia Blanca, Santa Fe, Corcordia and San Juan. The municipalities of Azul Quilmes and other small places are now calling for tenders for electric lighting. Many others will do so ere long, so that opportunities still exist for American enterprise in developing electrical work in all parts of the republic. Concessions for electric tramways have recently been granted to many individuals and companies, but only a few of them will be built.

The following concessionaires, in all probability, will build and equip lines ere long: Messrs. A. Pareus & Co., T. R. Betzel & Co., Palmgren & Co. and Gaston Roux. American manufacturers would do well to place themselves in communication with them.

The price charged for electricity (due to competition) has dropped from 30 cents per kilowatt, to small consumers, the price charged in 1897, to 20 cents at the present writing, but even at this figure the supply companies make a very large profit.

An interesting exhibit at the Chicago Cycle Show is a Veeder cyclometer attached to a small Ditch electric motor. The tiny instrument reels off about 50 miles a minute under the high speed of the electric motor and makes no fuss about it. A 100 candle power incandescent lamp throws light on the operation and attracts attention all over the hall.

Electric Signal Apparatus at Atlantic City, N. J.

The accompanying cut illustrates in detail the principal features of the electric signaling system recently installed by the Weather Bureau at Atlantic City, N. J. Mr. Al. Brand, the observer at that point, designed the apparatus and superintended its construction. He has made an official report on the subject from which the following particulars are taken:

The apparatus comprises a support and the signal lanterns, as shown in the cut. The fixed or lower portion of the support is built up of well-seasoned yellow pine in the shape of a sheath or channel, the dimensions of which are as follows: The two side pieces are 14 feet and nine inches long, and three inches by five inches at the top, gradually diminishing to three inches by six inches at the base. The center piece, which extends from within about one foot of the top to the base, is 2½ inches thick and of a sufficient depth to fill out the remaining space on one side of the pipe when the latter is in a perpendicular position. From about six inches below the pipe to the bottom of the support the center piece is built out flush with the sides. The three pieces of the support are securely bolted together with one-half-inch iron bolts. The support rests on a piece of timber three inches thick by 10 inches wide and two feet long, and is bolted to the chimney with three five-eighths-inch iron bolts. The metal portion of the support is built up of two lengths of galvanized-steel pipe, the upper portion of which is 18 feet long and 1½ inches in diameter on the outside, the lower portion being 20 feet long and 2½ inches in diameter on the outside. The smaller pipe is made

and down the side of the wooden support, on porcelain knobs, to the side of chimney, which it enters.

The lamps were wired with one 32 candle power incandescent electric lamp in each, and in such a manner that the oil lamps can be substituted at any time without delay. The manner in which the incandescent-lamp sockets were fastened to the inside of the lanterns will be best understood by an examination of a sketch showing a cross-section of lantern globe and lamp socket. It will be noticed that all that is necessary to firmly fix a socket in a lamp, when so wired, is to draw up the socket until the wire prongs, when spread out, will touch the sides of the lantern above the glass globe. By simply bending, in or out, the various prongs, the socket can be brought squarely in the center of lantern. All surplus wire should be drawn from the top of lantern.

The bottoms of the lanterns are fastened to the steel upright by a brass one-inch band passing around each lantern and bolted on either side of pipe, as shown in drawing.

The switchboard is made of enameled black slate, 15 by 18 inches, provided with two 32 candle power incandescent electric pilot lamps, having opalescent shades, and two baby knife switches. The mains and knife switches are fused on the front of the board. All connections are made in the rear of the board, which is set into a neat varnished oak frame.

Both the wood and metal portion of the support were given two good coats of paint, the first coat on the metal being mineral paint.

While a support erected along these lines insures an unobstructed display in every direction, it also permits of lowering the lanterns at a moment's notice, should occasion require, while the lanterns wired in this manner are not mutilated in the least.

Should neither a suitable wall or chimney be available for the erection of a support of this kind, it might easily be stayed by iron braces.

Influence of Electricity on Animals.¹

By HENRI COUPIN

The action of electricity on animals is still imperfectly understood. This study, especially as regards the lower animals, will doubtless lead to interesting results. With the aim of aiding in such investigations, which present no great difficulties, we propose to sum up briefly the state of our knowledge on this point.

Place under the microscope one of the amebas (A) that are so numerous in ponds, and leave it at rest. We shall see it expand into a gelatinous mass whose outline bears irregular "pseudopods" (false feet), with which the ameba crawls over the supporting surface. Now pass an electric current through the water in which it is. If the current is too strong, all pseudopods will contract. But if the current is weak, the pseudopods on the side of the positive pole draw in toward the mass, while those on the negative side continue to protrude. Thus the ameba moves from the positive to the negative pole B; we may then say it is "negatively electrotactic."

Examine a trachelomonad (C) in the same way; it presents the appearance of an egg-shaped mass, a little bristly on the surface and furnished with a long tail which is always in motion. By its means the infusoria moves about in all directions. If we now pass a current, we shall see the trachelomonad turn slowly so as to place its tail in the direction of the current, and move toward the cathode; it also has negative electrotacticism. Similar facts have been proved in the cases of numerous other infusoria. They always end by crowding up to the negative pole. The rapidity of this movement depends on the strength of the current; . . . if it is too weak, the infusoria do not react; if too strong, they are paralyzed and cannot move.

The experiments succeed very well with infusoria of the genus Paramecium (I). If we examine several of them, as soon as the current passes, we see them form in more or less curved lines uniting the two poles; under this form the position of the bacteria is like that of the iron filings in the well-known experiment showing magnetic lines of force (D). Little by little this arrangement disappears and the paramecia (E) crowd up toward the negative pole. Another fact may also be remarked. When the paramecium is not under the influence of a current it moves not in a straight line but in wide sinuosities (F). If a feeble current be passed, these curves become more evident (G). Finally, if the current is very strong, the paramecium describes sinuosities still more marked (H).

All these movements can be explained by the motion of the vibratile cilia, with which the body of the paramecium is covered.

The organisms of which we have been speaking are all negatively electrotactic. Others are positively so; that is, they move toward the positive pole. . . .

Still other organisms place themselves in a position directly across the direction of the current.

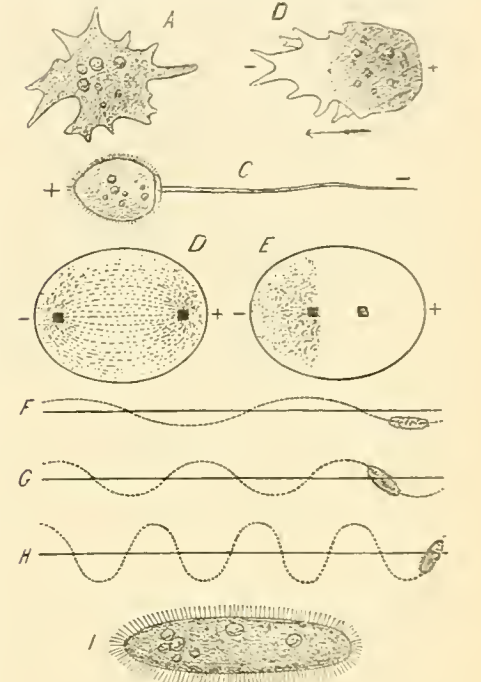
Most inferior organisms are thus sensitive to the electric current and modify their movements in consequence. Is it the same with higher organisms? A large number of experiments have been made with some results. . . . They show the curious fact that, in general, mollusks and worms are negatively electrotactic, while crustaceans and insects are positively so; at least, if we may generalize from a small number of instances.

Some experiments have been made also with vertebrates—fishes or tadpoles. They are placed in a trough of water whose ends are of zinc and connect with battery wires. When the current passes the fish or tadpole tend to turn with head toward the positive pole, but the results of these experiments do not always agree, which seems to show that the electrotactic sense in animal depends much on the intensity of the current.

Utilization of Electric Power.

"The Economic Use of Electricity in Power Transmission and Distribution" was the subject of a lecture delivered by Mr. W. B. Sayers at the Edinburgh University Engineering Society recently, in which the lecturer pointed out that the question of economy is a far more difficult one to answer than might appear at first sight, the reason being that the conditions upon which the answer depends vary between wide limits, dependent chiefly upon the nature and amount of the work to be done and its location, the nature of the source of power and its cost, and, again, the distance of the source of power from the place where power is required.

Assuming that the conditions in a given case are favorable to the use of electricity, at what point shall the transformation into dynamical power be effected? was one of the points considered. The factors upon which an intelligent conclusion must be based are convenience and cost. Convenience expresses something which is generally difficult or impossible to value in money; but, nevertheless, it would be difficult to exaggerate the importance of



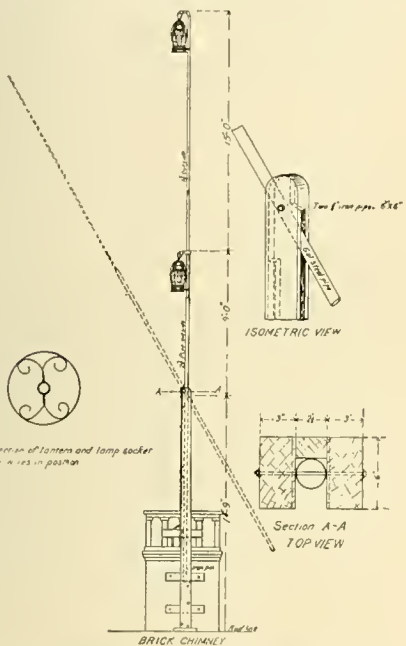
ACTION OF ELECTRICITY ON ANIMALS.

convenient arrangements in any manufacturing establishment. The difference between convenient and inconvenient arrangement is analogous to the difference between good and bad management. It is often the difference between success and failure, between profit and loss, for it must be borne in mind that the saving in time which is the inevitable result of improved convenience means not only reduced cost of production, but also increased capacity for output in a given time. The chief factor, however, is "cost." It has been indicated that improved convenience is worth paying for, but the question "how much" can only be answered in any particular case by good judgment and intuitive insight into the issues involved, or often enough by expensive experience only.

Interconnecting Cables for the Philippines.

Orders have been issued by the War Department to Colonel Maxfield of the Signal Corps to proceed to New York city and organize a cable detachment in connection with the laying of submarine lines in the Philippine Islands. The War Department has authorized the manufacture of 200 miles of cable, to be laid between the different islands of the Philippine group. The cable, with special machinery, which is also in the course of manufacture, will weigh between 700 and 800 tons, and will therefore require a special vessel to carry it and lay it. It is expected that this ship will leave New York soon after February 1st, and proceed to Manila through the Sue Canal. The Signal Corps has a short cable of eight miles now in operation in Manila Bay. The land lines in the Philippines are nearly 2,000 miles long, and are mainly on the islands of Luzon, Masbate, Cebu and Leyte. As soon as these lines are united into one system through cable connections, the military administration of the islands will be conducted with a degree of efficiency, rapidity and economy impossible under present conditions.

1. Abstract from La Nature.



ELECTRIC SIGNAL APPARATUS AT ATLANTIC CITY, N. J.

to pass into the larger for a distance of about three feet, and made thoroughly rigid at that point with molten metal. Steel elbow and "T" fittings, short pieces of pipe and hooks are used in making the short horizontal arms on which the lamps are hung, and which are fastened to the tops of both the larger and smaller pipe, as shown in the drawing. The centers of the hooks on which the lamps swing are at a distance of just one-half of the diameter of the bottom of a lamp from the side of the upright pipe. This insures the lamps swinging plumb, and at the same time snugly against the pipe, thus relieving the latter from all unnecessary strain. The steel pipe swings at a point within six inches of the top of the wooden support, on a one-half-inch hardened steel pin, which passes through the larger portion of the pipe at a point nine feet below the bottom horizontal arm, washing in two three-eighths-inch iron plates.

The pipe being swung into a perpendicular position (which causes all of that portion of the pipe below the pivot pin to enter into the channel), it is securely locked in place by a five-sixteenth-inch steel pin near the base.

A block of 2½ inches wide and about six inches long, and of a sufficient depth so as to fill out the remaining space on the front of pipe, is bolted between the side pieces just above the pivot pin.

All of the wire used on the support or in the lamps is what is known as canvasite cord made up of two strands of flexible wire. A separate circuit is run from each lamp to the switchboard in the office. The wire, being connected with a porcelain weatherproof socket (care being taken to have the socket fastened to the inside of lantern in such a manner that the bulb of the incandescent lamp hangs squarely in the center of the lantern lenses), passes out through the ventilation opening at the top of the lantern, and enters the pipe at the "T" fitting in each of the short horizontal arms, thence passing down on the inside of the pipe to a point about three or four inches above the top of the wooden portion of the support, where a hole has been drilled to allow of its passing out

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CORRESPONDENCE relating to electricity or any of its practical applications is cordially invited, and the co-operation of all electrical thinkers and workers earnestly desired. Clear, concise, well written articles are especially welcome; and communications, views, news items, local newspaper clippings, or any information likely to interest electricians, will be thankfully received and cheerfully acknowledged.

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...and many folks believe them, that the traffic in electricity is yet in its infancy.—New York Sun.

Our electrical contemporary has been deceived. He has not said anything of the kind, and his readers, by hearing others ring the changes, have been misled.

...the following... the Bell interest... the new interest... the Bell interest...

one to see an object in its natural colors a great distance by means of an electrical device, announces that he has invented an apparatus operated by a beam of light which he has applied to exploding bombshells." The gentleman with an unpronounceable name should show some results before making further announcements. His "inventions" are all in his mind, and they consist mainly of extravagant claims which he has shown no disposition to perform.

The passing of the populists in Kansas was marked by a characteristic act on the part of the Governor Leedy, whose last official act was his approval of the "15-cent telegraph bill." The act provides for reducing telegraph rates and placing telegraph companies under the supervision of the "Court of Visitation." The rate fixed in the bill on messages is 15 cents for the first 10 words, day or night, and one cent for each additional word. On newspaper reports the rates are reduced to one-third of one cent for each word during the day and one-sixth of one cent for each word at night. It provides that no lower rate shall be granted to anyone. Lawyers contend that the act is unconstitutional, and the telegraph companies will probably bring a test case in the United States court.

Corporations formed the subject of the farewell message of Governor Holcomb of Nebraska and the inaugural address of his successor, Governor Poynter. Both governors strongly reprobate the use by the federal courts of the writ of injunction to nullify state laws intended to regulate corporations and their charges.

Governor Stephens, in his message to the Missouri Legislature, urges specific legislation providing for the taxation of "that intangible class of corporate property known as corporate franchises." He continues: "As an evidence of this intangible property known as the franchise, in one of the great cities of this state recently a gigantic corporation has contracted to pay, in round numbers, \$1,000,000 for the franchise over certain streets in that city."

Not to be outdone by his contemporaries, Governor Pingree of Michigan takes a shy at corporations generally and makes a special attack upon the Associated Press, which he says "has been able to distort the truth in many prominent instances and to poison with such distortion the very fountain of popular information." In view of the fact that the Associated Press has contributed largely to Governor Pingree's efforts to keep himself prominently before the public, this attack seems rather ungrateful.

The attitude of the American Bell Telephone company toward the public and the independent companies engaged in manufacturing telephone apparatus and operating exchanges equipped with these instruments indicates that the old concern has not yet come to a realization of the change that has taken place in the field of telephony during the last few years. It is now making futile efforts to regain its prestige in Michigan and has adopted the policy of "crushing out competition." Whenever possible it will absorb independent companies; elsewhere, it will endeavor to accomplish the same end by cutting prices below the actual cost of operation, hoping thereby to exhaust the resources of the independent companies which depend upon local merchants and are supplied with limited capital. In other words, all the wealth and powerful influence of the Bell interests will be concentrated in this effort to demoralize the independent telephone business in Michigan. It is not contended that the successful execution of this plan will prove profitable to the Bell interests; on the contrary, it is admitted that this policy will entail great financial loss, but the object to be gained, it is asserted, warrants even greater expenditure than that contemplated. By successfully attacking the independent interests in Michigan the old company hopes to gain a supremacy that will fill its rivals with dismay, and make its task easier in other localities.

But the chances are that the Bell interests will soon find that they have undertaken a much greater task than they anticipated. They will find that the independent companies are thoroughly organized, but local interests will prevent them from selling out, and that they will receive hearty support and

encouragement from the people in their fight against the old corporation. They will find it necessary to reconstruct the entire Bell system throughout Michigan in order to compete with the independent service on any terms. Since the establishment of the new companies the people have been educated up to a higher standard than obtained during the days of the monopoly of the Michigan Telephone company, and they will not be satisfied with inferior service. The investment required for the duplication of the system of the independent companies throughout Michigan, and the loss entailed in "crushing out competition" by giving free service for two or three years, will prove a costly experiment to the syndicate that has undertaken to redeem the state from the independent companies and reestablish the old conditions. Assuming the possibility of successful termination of this movement, the question arises, How is the Bell company going to recoup its losses? Certainly not by reestablishing the old rates for service. Any attempt of that kind would invite fresh competition. The problem is an interesting one.

American electrical manufacturers who desire to extend their foreign trade will be interested in the preparations that have already been made for the exposition of American products and manufactures especially adapted for export, to be held at Philadelphia, and the plans that have been adopted for bringing this unique exhibition to the attention of foreign purchasers. The exposition will be formally opened on September 15th, and it will continue until November 10th. It has been pointed out that the forthcoming exposition offers an exceptional opportunity for gaining information concerning the commerce of other countries, their customs and commercial relations, their system of communication and transportation, with special details of freight rates, tariffs, exchanges and kindred subjects. The exposition will be sufficiently broad in its scope to command the good will and co-operation of manufacturers and others interested in the development of American commerce.

A special feature in connection with the exposition will be an international commercial congress, at which will be represented not only the leading chambers of commerce of Mexico, Central and South America, but assurance is also given that delegations from South Africa, India, Australia, China, Japan and other countries will be in attendance. This will bring together about 400 leading merchants from all parts of the world, who will come to make business connections in the United States, and to discuss the best means of extending the American trade in their respective countries. This meeting will in a measure resemble the international commercial congress held in 1897 under the auspices of the Philadelphia Commercial Museum, but will be on a much more elaborate scale. The delegates to the last congress were prominent merchants appointed by the leading commercial organization of Spanish-American countries. During the meeting in Philadelphia and the subsequent tour to some of the principal industrial centers of this country, the expression most frequently noted on the part of these delegates was one of amazement and surprise at the degree of perfection attained by American industry. In the reports which they have made to their chambers of commerce no fact has been more strongly emphasized than that the products of the United States are not sufficiently known abroad, and that it is to the interest of a foreign merchant to make a careful examination of the field.

The convocation of this congress affords a most excellent opportunity to American manufacturers to secure good connections in foreign countries. It will attract large numbers of buyers from all parts of the world, and these foreign merchants will have an unusual opportunity to study and examine what they can best buy in the United States. To those who are familiar with the condition of the electrical trade abroad this exhibition is particularly interesting. American electrical appliances are in growing demand in foreign countries, and any means calculated to increase this demand should be heartily supported. The increase in electrical output and the advance and improvement in this line of manufacture are more marked than in any other class of manufacturing.

INDUSTRIAL COMBINATIONS.

The opening days of 1899 have witnessed the conclusion and announcement of several deals for the combination of manufacturing or operating companies working in the same lines—the tendency to concentrate the business of the country in a comparatively few hands so noticeable in 1898.

Electric Company of America.

Articles of incorporation of the Electric Company of America were filed on January 5th with the secretary of state of New Jersey. The company has an authorized capital of \$25,000,000. Its expressed objects are to manufacture, produce, purchase, own, use and sell to public and private users coal, coke, gas, oil, electricity, light, heat, steam and compressed-air power, water, etc., and to own, acquire, construct and lease and operate plants in connection therewith. The incorporators are James E. Hayes of Camden and Elmer Smalling and Arthur Phillips of Philadelphia. The company, it is understood, is organized for the purpose of acquiring and operating the electric-light plants in different cities, particularly in and near Philadelphia. It is said to be backed by the Widener-Elkins syndicate. The new company has just the same amount of capital stock as the New York Gas and Electric Light, Heat and Power company, which is undoubtedly trying to control the lighting business of New York. As the New York company is closely allied with the Metropolitan Street Railway company, so, it is believed, is the Electric Company of America with the Union Traction company of Philadelphia. However, Mr. W. C. Whitney, the moving spirit of the New York combination, is said not to be interested in the Philadelphia scheme, which is attributed to P. A. B. Widener, William L. Elkins, Thomas Dolan and their associates.

United Lighting and Heating Company.

It is believed that the Widener-Elkins combination of capitalists is behind the new United Lighting and Heating company, with its \$12,000,000 capital. A dispatch from Philadelphia, on January 5th, reported the completion of the deal between the Pennsylvania Globe and Gas Light company and the Kitson Incandescent Gas Light company of that city, the negotiations for which deal have been in progress for several weeks. The dispatch continued: "The agreement involves the formation of a new corporation, known as the United Lighting and Heating company, which will control the street-lighting business of the Pennsylvania Globe and Gas Light company, the Welsbach Street Lighting company of Chicago, the New York and New Jersey Globe and Gas Light company of New York, the Chicago Globe and Gas Light company of Chicago, the Canton Globe and Gas company of Canton, O., the Kitson Incandescent Gas Light company and two other companies. The ultimate object of the company is to control the street-lighting business throughout the United States." The new company was chartered under the laws of the state of New Jersey, with a capitalization of \$12,000,000.

Combination of Carbon Makers.

[From the Chicago Record.]

The National Carbon company will be organized about January 16th, under the laws of New Jersey, with a capital of \$10,000,000, \$4,500,000 of which will be in seven per cent. non-cumulative preferred stock and \$5,500,000 in common stock. The corporation will absorb the principal manufacturers of carbon supplies, particularly electric-light carbons, carbon brushes for motors and electrolytic carbons for all varieties of smelting purposes. Arthur J. Eddy of Chicago, who was prominent in the organization of the American Linseed company recently, is the promoter of the enterprise, and Chicago capital is interested.

Contracts have already been closed for the purchase of the plants of the following-named carbon companies: The National Carbon company, Cleveland, O.; Brush Carbon Works; Standard Carbon Works; Crouse & Tremaine Carbon company, Fostoria, O.; the Thomson-Houston Carbon company, Fremont, O.; Paraday Carbon company, Jeannette, Pa.; Phoenix Carbon Manufacturing company, St. Louis; American Carbon company, Noblesville, Ind.; Washington Carbon company, Pittsburg; Partridge Carbon company, Sandusky, O.

In addition to the United States industries, the new company will own a half interest in the Ottawa Carbon company of Ottawa, Canada, which company controls the carbon industry of Canada.

The new company assumes no debts or liabilities of any description. It purchases the various properties upon conservative appraisals, free of all liens, and it will have in the treasury a working capital of \$600,000. The following-named men will serve upon the board of directors of the permanent organization, with two directors yet to be named: W. H. Lawrence, president National Carbon company, director Cleveland Trust company; Myron T. Herriek, president Society for Savings, Cleveland, and receiver of Wheeling and Lake Erie Railroad company; James Parmelee, president Cleveland Electric Illuminating company, vice-president Cleveland Electric Railway company; James Humbird,

president Washington Carbon company, Pittsburg; E. D. Dickey, Jeannette, Pa., president Paraday Carbon company; Webb C. Hayes, Cleveland, O.; J. C. Van Blarcom, cashier National Bank of Commerce, St. Louis.

Subscriptions to stock will be payable when stock certificates are issued and ready for delivery, which will be about January 23d. Facilities will be provided in advance for the registration and transfer of stocks in Chicago.

American Steel and Wire Company.

It is announced by the American Steel and Wire company officials that the various steel and wire interests in this country are to be consolidated into a new corporation, to be known as the American Steel and Wire company of New Jersey. The consolidation will include the present American Steel and Wire company, the Washburn & Moen Manufacturing company of Worcester, Mass., and Waukegan, Ill., the Worcester Wire company of Worcester, the Cleveland Rolling Mills company of Cleveland, O., the Newcastle Wire Nail company of Newcastle, Pa., the Pittsburg Wire company of Pittsburg, the Cincinnati Barbed Wire Fence company of Cincinnati, the Laidlaw Bale and Tie company of Joliet, Ill., and Kansas City, the Consolidated Barb Wire company of Lawrence, Kan., and Joliet, Ill., the Newburg Wire and Nail company of Newburg, N. Y., the Oliver Snyder Steel company of Pittsburg and the Oliver Wire company of Pittsburg, Pa., and several other companies. The new concern will have a capital stock of \$90,000,000, of which \$40,000,000 will be preferred seven per cent. cumulative, having lien on assets prior to the common stock, and \$50,000,000 common stock.

The Washburn & Moen company was the last of the big companies to go into the combination. It is said that the stock of this company was transferred to the syndicate for more than \$8,000,000.

This company will control the bare-wire and wire-nail markets of the country. The main offices will be in Chicago, and it is said that all other offices, excepting mill offices where plants are located, will be given up.

Rubber-covered Wire Interests.

A number of insulated-wire men met in Chicago early in the week. They consulted with the underwriters about the new wiring requirements, but a Chicago daily newspaper asserted that they also discussed plans for the formation of a pool. However, the statement is denied by the wire men and seems unlikely.

Electric-lighting Companies of Northern New Jersey.

[From the New York Sun, January 4th.]

At a meeting of the board of directors of the People's Light and Power company in Newark yesterday it was decided to increase the capital stock from \$5,000,000 to \$20,000,000, in view of the absorption of the Hoboken and Elizabeth Electric Light companies. The People's company has no bonded indebtedness, and the officers say that not more than one-third of the authorized increase in stock will be issued at present. The company has \$5,000,000 of stock outstanding, and President Philip Ney Jackson thinks that the same amount of increase will cover the recent purchases. Mr. Jackson has been working assiduously for years to get control of all of the electric lighting in northern New Jersey. The companies which have been absorbed through his instrumentality are the Newark Electric Light and Power company, Newark Schuyler Electric Light company, Thomson-Houston Electric company of Newark, Central Power company, Consumers' Electric Light and Power company, Excelsior Light and Power company, Kearny Electric Light and Power company, Jersey City Electric Light and Power company, Essex County Electric Light company of East Orange, Suburban Electric Light and Power company of Orange, Montclair Light and Power company, Edison Electric Light and Power company of Newark, North Hudson Heat, Light and Power company of Hoboken, and the Consumers' Heat, Light and Power company of Jersey City. At the meeting yesterday afternoon it was resolved that a material reduction should be made in the charges for lighting, and a number of costly improvements were authorized.

Brooklyn Railways.

It is now asserted that the owners of the Brooklyn Rapid Transit company have secured control of the stock of the Nassau Electric Railroad company, and that the formal consolidation of the two companies will soon be effected. R. P. Flower and Anthony N. Brady are largely interested in the Rapid Transit company, and Tom L. Johnson and brother and P. H. Flynn controlled the Nassau stock. It is said that President Clinton L. Rossiter will be placed in charge of the united surface lines when consolidation comes and that Mr. Brackenridge will be chief engineer. Messrs. Flower and Brady are said to be satisfied with Mr. Rossiter's management of the Heights system, which last year earned more than \$700,000 in excess of any year's earnings since the road came into the possession of the present management, and, at the same time, the expenses of the road are less than they were when Mr. Rossiter

became president. The system has been almost entirely relaid with new rail, and the company has built a car shop, at a large outlay, capable of building its own cars if the manager desire to do so. President Rossiter and Colonel T. S. Williams have labored early and late to produce satisfactory results, and they are now able to point to the fact that, while three years ago, Rapid Transit stock was selling at 25, it is now above 90 and rapidly approaching the 100 mark.

There is some talk to the effect that ultimately the elevated and surface railway and electric-lighting interests of Brooklyn will be all under the Flower-Brady management.

Electric-lighting Situation in New York.

The New York Sun, which ought to be pretty good authority, says that on January 5th it was reported on good authority that negotiation for the purchase by William C. Whitney of the Edison Electric Illuminating company, while not yet completed, had got so far that they pointed to the control of the company passing to Mr. Whitney very shortly. The Edison company, when purchased, will be added to the properties already acquired by the New York Gas and Electric Light, Heat and Power company, which is backed by Mr. Whitney, P. A. Widener, W. L. Elkins, Thomas Dolan and other capitalists.

Electric Railroads in Russia.

The American consul at Moscow calls attention to the fact that the government is favorably disposed toward the building of electric railroads. The Ministry of the Interior is at present considering the question of constructing a network of electric railways in Riga and the Town Corporation has taken the matter in hand. The ministry has expressed its willingness to support the town by allowing a loan for the purpose on profitable conditions. The general cost of constructing the electric roads in Riga has been determined at 1,600,000 rubles, or \$800,000.

It is reported that the czar has sanctioned the building of an electric railroad from Warsaw, via Lodz and Kalisz, to Skalmierzycze. From this point connections will be made with Ostrowo, Krotoschin and Lissa. From Lieradz and Storce a branch line will run to Wilhelmsbrück, Kempen and Oels. The work should be advanced sufficiently so that passenger traffic may be opened up in 1900.

Infringement of Series-parallel Controller Patent.

The preliminary injunction obtained for the General Electric company against the Nassau Electric Railroad company of Brooklyn, on September 13th, prohibiting the latter company from infringing on the patent (No. 393,323) granted to G. H. Condit for series-parallel-controller operation of electric cars, has been made permanent. The apparatus complained of as infringing the Condit patent was supplied by the Steel Motor company. Judge Lacombe granted the preliminary injunction, and the United States Circuit Court of Appeals for the Second Circuit directed that it be made permanent. The order of the court directs the Nassau Electric Railroad company to remove at least 250 of the offending car equipments by January 28th, and to continue so doing at the rate of 250 a month until August 1st, when all the infringing apparatus must have been removed.

Electric Lights in a Small Southern Village.

An occasional correspondent of the Western Electrician in Charlotte, N. C., sends the following: "We have in this state probably the smallest town in the South with electric lights, this being Elkin, N. C., with a population of 350 to 400. The system is 220-volt, two-wire, with independent residence and street circuits. Current is supplied from a 25-kilowatt, slow-speed Crocker-Wheeler dynamo, driven by an automatic engine. The fuel is cordwood, which is cheaper there than coal, and this plant has given more satisfaction than most of the other town plants in the state. The proprietors are using eight Helios arc lamps singly on the 220-volt circuit and 32 candle power incandescent lamps in Cutter street hoods for the street lighting. For residences and stores eight, 16 and 25 candle power lamps are used."

Pacific Cable Projects.

In the United States Senate, on January 7th, Mr. Lodge introduced, by request, a bill to provide for a submarine cable between the United States and Hawaii, the Philippines, Japan, China and Australia. The postmaster-general is authorized to contract with the Pacific Cable company of New York for the payment of \$125,000 a year for 20 years, for transmission of official messages from San Francisco to Honolulu, the line to be laid by December 31, 1900. Before December 31, 1902, the company shall construct a line from Honolulu to Manila, with an additional sum of \$125,000, to be paid annually by the government. Within four years the company shall lay connecting lines to Japan, for which \$25,000 a year for 20 years shall be paid. The rates fixed between San Francisco and Honolulu are 35 cents a word, and to the more distant points \$1 a word.

DEVELOPMENT OF THE TELEPHONE FIELD.

Telephone Situation in Michigan.

[From the Detroit correspondent of the Western Electrician.]

The sale of the Michigan Telephone company to the Cleveland Telephone company, which was announced last week, carries with it much more significance than appears on the surface.

Those who claim to know say the real meaning is that it is another step toward fighting all telephone companies not using Bell instruments. The fight will be made at the cost of millions of dollars, but in the end the Bell people all over the country propose, if they can do it, to be in the telephone just as the Standard Oil company is in its own particular line of commerce. All this provided opposition can be crushed to the wall.

The new president of the Michigan Telephone company—for it will continue to maintain a separate organization—is Charles J. Glidden, president of the Cleveland company. Mr. Glidden is not a Cleveland man. His home is at Lowell, Mass., and not many years ago he was a telegraph operator. Now he is a telephone magnate and promoter. It has become his business to be made president of telephone companies. Every few weeks he adds another presidency to the list, and now he is, nominally at least, the head of the Bell companies in Texas, Minnesota, Arkansas, North Dakota and several other states.

Under the old rule the Michigan Telephone company, controlling all the Bell exchanges in the state of Michigan, had to fight all opposition within the state and stand the expense involved, the patentees only agreeing to fight patent infringements. Accordingly, in the states where opposition is strongest the profits of the Bell stockholders are smallest, and where the opposition is weak the profits are not materially interfered with. Michigan is counted one of those states where opposition is uncomfortably strong and growing rapidly. This unequal battle of the states has done much to encourage rival companies, and each year has shown them stronger than before.

For the absorption of the several operating companies there will be formed a gigantic telephone syndicate, with millions at its back, prepared to make a bitter fight for the control of the telephone business of the United States. For the purpose of this consolidation Mr. Glidden is the president. He is in reality the personal representative of the millionaire syndicate. Whenever it is thought best to begin active operations against opposition lines the necessary funds are to be taken from the general pot. They will not lessen the profits of Michigan any more than those of New York or California.

"There is no question but what it will be a fight to a finish," said a man who is in close touch with some of the Bell magnates. "Either the Bell will be the only telephone in use or it will be driven out of the field. There can't be any other result."

"Will opposition companies be bought out?"

"That depends. Where it will cost less than to fight, yes; where not, then no."

"Supposing that opposition companies are driven out, does it mean that the rates will go up?"

"I can't say as to that. I can only refer you to what is being done now. You know that the fight has been reopened with much vigor in this state. In towns where exchanges are being reorganized the Bell people's contracts call for 10 years at the price stated, with a six months' notice on the part of the subscriber to cancel the contract. In any event, you know, the Standard Oil company hasn't raised the price of oil. See the comparison?"

Speaking of the fight in Michigan, the same man said that many millions of dollars were to be spent in Michigan alone in bettering the plant. For instance, all the wires in Detroit are to be put underground and all wires to other towns would be in cables, either underground or aerial.

"The system is to be perfected," he said, "before the war begins in real earnest."

Friday night a director of the Michigan Telephone company, who would not allow his name to be used, while neither admitting nor denying the story of the general combine of state companies, said this concerning Michigan:

"We intend to fight this battle to a finish. There is no doubt about this. We have millions at our disposal for bettering our plants, and we will not rest until all opposition has been swept away. This is emphatic."

This activity on the part of the Bell companies will undoubtedly bring about a combination of anti-Bell people, and the telephone organization which was formed here two years ago may prove an important factor in the impending struggle.

From Cleveland come the story of the transfer of a large part of the stock of the Michigan Telephone company, together with the actual management of the concern, to the Cleveland Telephone company. The report continues: The Michigan company operates exclusively under the American Bell Telephone company's license in Michigan, with 15,000 subscribers and 10,000 miles of long-distance wire. The assets of the company are \$2,500,000.

The new arrangement places under the Cleveland management the largest number of subscribers in the United States," and J. P. McKinstry, general

manager of the Cleveland Telephone company. "There are in all 50,000 subscribers and 30,000 miles of toll line. The added development of this combined territory cannot be less than 15,000 subscribers in 1899, comprising the states of North Dakota, South Dakota, Minnesota, Michigan, Arkansas and Texas. It would not be surprising if the copper district in Northern Michigan were talking with Boston before the close of the year. Full details cannot yet be given, but some important changes in policy of management will be made ultimately."

Mr. McKinstry also expressed the opinion that the tendency was toward the consolidation of all the operating companies under the direct management and control of the parent organization.

"As a matter of economy, if for no other reason," said Mr. McKinstry, "I think sooner or later all the companies working under Bell licenses will be combined into one great corporation, just as all of the several telegraph companies of this country were merged into the Western Union company a quarter of a century ago.

"However, I have no official knowledge this step is at present being considered, but there is a natural tendency toward such a movement, and it is, in my opinion, bound to come."

New England Telephone Notes.

[From the Boston correspondent of the Western Electrician.]

Mayor Josiah Quincy has signed the order recently passed by the Boston Board of Aldermen, authorizing the Massachusetts Telephone and Telegraph company to establish a new underground system, the company making a contract with the city by which the mayor was able to gain further advantages for the municipality not set forth in the original order. The chief additional provisions require the company to furnish without charge in the underground system a duct for carrying the city's fire-alarm wires, and to furnish within the limits of the city as many different kinds of service, and at as low rates, as the New England company now furnishes. Two years is to be the extreme limit of time allowed the company for its equipment and operation of at least one telephone exchange. It is stated that the people connected prominently with the promotion of the corporation have been largely interested in the Lamson Store Service company, Messrs. Ames, Shepard, Titcomb and Counsel Gilman being in this list, and President Z. S. Holbrook was formerly Chicago manager.

Some of the directors of the Boston and New York Telephone and Telegraph company, incorporated in New Jersey December 17th, are among the men interested in the new Massachusetts company, and it is presumed that the New Jersey corporation is to work in conjunction with the one in Massachusetts, and connect the two cities with long-distance service, although plans are not yet fully announced.

Bell Telephone Business for 1898.

In last week's issue of the Western Electrician it was stated that the American Bell Telephone company's output for the year was about 194,000 instruments. This number was secured by taking the company's reports for 11 months of the year and carrying out the proportion for December. But the official report for the last month of the year is now at hand, and it appears, from the unprecedented demand for instruments in December that the Western Electrician's estimate was too low. The net output for that month, according to the company's statement, was 27,771, while the average for the other months of the year was about 16,000. It is stated that for the month ended December 20th the company was unable to fill the orders received for instruments. These orders called for 51,477 instruments, whereas its gross output for the month amounted to 41,937 instruments.

The net output for the year was 205,725 instruments, and the total number of outstanding Bell telephones is now stated to be 1,125,246. The total number of instruments outstanding five years ago was 582,506. This number was increased to 676,536 in 1895, to 773,849 in 1896, to 922,253 in 1897, and 1,125,246 in 1898. The figures are taken from the Boston News Bureau.

Bell Interests in Michigan.

The Detroit correspondent of the Western Electrician announces that "a report has been received from Niles that the American Bell Telephone company is negotiating with newspapers in every city in Michigan which has independent telephone service, asking for advertising rates and offering to pay in advance. It is understood that the company intends to reduce rates to a point which will drive out all competition.

"The Taxing Board at Lansing has assessed the new Detroit Telephone company the sum of \$10,000. The company will try to have it reduced.

"About January 15th the Michigan Telephone will issue a new directory for Detroit. Manager Forbes says it will contain 1,500 more names than a year ago."

Telephone Service in Chicago.

Two interesting contributions, relating to the telephone service in Chicago were presented in the Chicago Record of January 2d. The first is by Angus S. Hibbard, general manager of the Chicago Telephone company, and presents the Bell company's views on the situation. The other is an incidental reference by Charles G. Armstrong, an independent engineer, in the course of a review of the year.

Mr. Hibbard makes the following statement of the present condition of development of the Bell service:

"During the past year the number of telephones operated in Chicago and vicinity by the Chicago Telephone company has increased to a greater extent than ever before in the history of the company, and the daily use made of the telephones in the Chicago exchange has so increased as to require large additions to the operating plant of the company and to the forces employed.

"Two new exchanges have been opened in the downtown district—one, known as 'Central,' being located in the Chicago Title and Trust building, 100 Washington street, and the other, known as 'Harrison,' in the Manhattan building, 315 Dearborn street. The operating appliances in these offices are of the very latest design and have given excellent satisfaction. The lines in the central office form a group of about 1,500 of the busiest telephones ever served from one office, each line being used, on the average, 80 times every day, so that, notwithstanding the rapid work performed by means of automatic signals, the force of operators required for their service has been unusual.

"The wire plant of the Chicago exchange has been increased during the year by more than 10,000 miles of wire, there now being nearly 48,000 miles of telephone wire operated in Chicago, over 40,000 of which is contained in cables. The amount of overhead wire on poles has been reduced during the year and consists now largely of short feeder lines leading from the main underground extensions to the premises of the subscribers.

"The rate of use of Chicago exchange telephones has increased during the year from 220,000 to over 270,000 calls daily, 50,000 calls more per day being handled now than at the same time last year.

"The party-line residence service has been extended largely, and more telephones are now operated in residences in Chicago than in any other city in the world.

"During the coming year extensions of equal importance are to be made in the Chicago exchange. New operating apparatus is to be placed in the main office, 203 Washington street, providing for the operation of metallic-circuit lines. A new exchange, known as "Monroe," is to be located in Sangamon street, near Madison street, in a building about to be erected by the company.

"The toll lines operated by the company and radiating in all directions from Chicago now reach 145 cities and towns, in 58 of which exchanges are operated by the Chicago Telephone company. Important extensions have been made by the long-distance company, reaching to Kansas City and all important towns in Missouri on the west, and also northwest to St. Paul and Minneapolis and throughout Minnesota and the Dakotas. The telephone business between Chicago and New York has increased steadily throughout the year, and business is now accomplished by long-distance telephone which formerly required a trip to the distant point.

"In every department of the service it has been demonstrated to a greater degree than ever before that the best kind of a telephone in the office or on the desk of a busy man, or in a private residence, is one of the most valuable facilities for the expedition of business."

Mr. Armstrong concisely presents the views of the subscribers in the following summary:

"So far as the telephone octopus is concerned very little improvement has been made in their instrument, but some slight improvement in switchboard apparatus has been brought about in this city, the Chicago Telephone company having established a new exchange, which, it is hoped, will better the service somewhat, although so long as they provide the subscriber with the oldest form of telephone known there is little to be looked for. On the other hand, the opposition companies are struggling to bring out the best and newest thing in their line, with the result that thousands of private parties are installing telephones for office, warehouse and store use, and hundreds of exchanges are being put in all through the country, and in some cases the Bell people have been compelled to cut their price to as low as \$1 a month. But until we can get good, healthy competition in the city of Chicago nothing can be hoped for in either improvement of service or reduction of price.

"During the last year the dime-in-the-slot telephones have been declared against by the City Council, and the opinion has been passed by the city attorney that they are unlawful and that the company has no right to maintain them under its charter. The telephone company meantime is still maintaining the dime-in-the-slot machines and will probably continue to do so."

Eureka Express Switchboard.

For the central-station telephone switching apparatus herewith illustrated the manufacturers make especial claim for rapidity of operation, simplicity of construction and economy of maintenance. Each drop and jack is self-contained, and can be removed and replaced in less than 30 seconds by a novice without disturbing the night-bell circuit, a single-line connection or using a tool. The clear-out drop and operator's cam are self-contained and removable.

The following description of the board drops and their method of operation will be of interest to exchange managers:

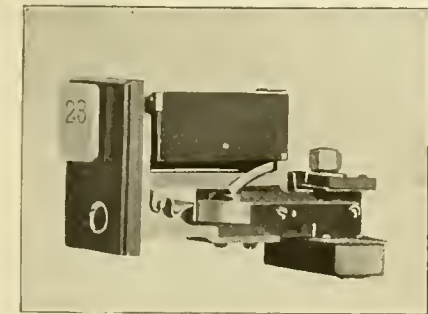
The boards are built in 100-line dust-proof frames, finished in quarter-sawed oak, and so arranged that, by removing the molding from one side of the cabinet, additional cabinets can be placed side by side, thereby increasing the capacity of an exchange 100 numbers at a time without disturbing the first section installed, or, if larger frames are desired, they can be furnished. Each 100-line metallic board is equipped with a full complement of operator's set, comprising 10 pairs of strong, heavy plugs and reinforced cords. These cords are so manufactured that they allow a set-screw clamp

them into the plug handles in such a way that there is no pull upon the tinsel of the cords, and this arrangement does its work so efficiently that it is impossible to pull a cord from a plug in service. The operators can kink the cord closely up to the plug without fear or danger of breaking its connections. Over each set of plugs is a self-contained clear-out drop and listening and ringing cam that controls the ringing on either cord and the cutting in and out of the operator's set.

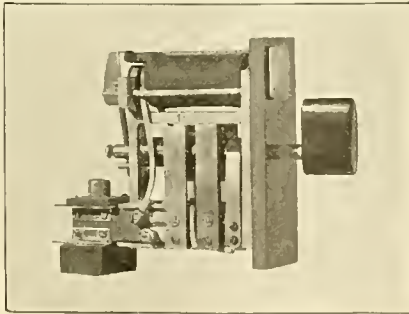
With each operator set is included a hand generator warranted to ring through a resistance of from 35,000 to 40,000 ohms, and it can be adapted for ringing either series bells on short lines or also those of high resistance, where it is desired to ring a maximum number of bridge bells over a long bridge line.

The Eureka long-distance amplifying solid-back transmitter has a metal solid back, eliminates all vibratory action and is serviceable and firm. The transmitter is suspended from a neat arm and is adjustable. The equipment also includes long-distance silk-wound induction coil, with fiber-rubber heads, screw and washer terminals and soldered connections, night-alarm bell, gravity batteries for transmitter and night-bell circuits, double-pole receiver and spring head-band, organ-stop switches for changing the ringing circuit from hand to power generator and to cut on and off the night-bell circuits. The total width of the board is 19 inches.

The Eureka Electric company manufactures these boards in any size cabinet desired, 100-capacity size being standard. Metallic boards are built either



Drop.



Cam.

EUREKA EXPRESS SWITCHBOARD.

for common-return, ground or complete metallic circuits, for use with either series or bridging telephones, or a combination of both. For large exchanges a transfer system is provided.

In place of the drops falling upon the board, the Eureka express drops fall sideways, as shown in the cut. With other types of self-restoring drop boards, a jar is liable by accident to drop shutters and retard the work of the operator, as she will be unable to determine which indicate calls and which are the result of accident.

In the Eureka board the drops are held firmly in position and current must pass before the armature will release the drop. After a call has been made and the drop has fallen, the operator inserts a plug into the jack which throws the operator's set in connection with the subscriber making the call. The operator does not have to move the listening cam to complete the circuit, which is established immediately by the insertion of the plug. After learning the number desired, she takes the mate of the plug used and inserts it in the jack of the drop to which connection is desired. This movement establishes the circuit, and, by turning the operator's

cam to the right, rings the subscriber wanted without, in any way, ringing back into the first subscriber's ear. Then by a slight movement of the operator's cam to the left she throws the operator's set out of the circuit. The insertion of the plugs cuts out the main line drops and cuts in a high-wound bridged automatic restoring clear-out drop. At any time, should the operator desire to learn if the lines are busy, a slight movement on the switching circuit will throw her in circuit.

When use of the line is discontinued, the ring-off from either side will drop the clear-out drop of the circuit, and the operator may restore the cam to its normal position, which automatically restores the ring-off drop. Each ring-off is self-contained in a hard-rubber case, with its own operator's cam, and is easily accessible at any time.

This board has proven its efficiency by several years of hard service, and it is now giving entire satisfaction in exchanges where the conditions are unusually exacting. In one of these a board of 300 numbers is operated satisfactorily by one person.

In construction, it is claimed, this board embodies many advantages, the electrical and mechanical work being of an unusually high order. The quality of the material used is high-grade and the durability of each component part guarantees long life under the most severe use.

New York Telephone News.

The New York and New Jersey Telephone company has declared a quarterly dividend of 1 1/4 per cent. An extra dividend of one per cent. has also been announced. Both are payable January 14th.

Commissioner Kearny of the Department of Public Buildings, Lighting and Supplies of New York has sent to the City Council a communication announcing that he had ordered the New York and New Jersey Telephone company not to answer any calls on long-distance telephones to other cities and out-of-town places coming from telephones in public buildings. The bills for long-distance calls for the last year, the commissioner said, had been enormous, and he was satisfied that all, or nearly all, the calls had been on private business. City officials and others who wish to talk with persons outside the city will have to use other telephones in future than those in public buildings.

Through the presence of mind of one of the employes of the New York and New Jersey Telephone company, says the New York Tribune, a serious accident was averted. Though the man was terribly and painfully burned about the face and arms, he saved a comrade's life and prevented an explosion which would have caused much damage and possible loss of life. Harry C. Johnston, 25 years old, of No. 268 Bridge street, Brooklyn, and Frank Rockhold of No. 286 Barrow street, Jersey City, were working in the telephone company's manhole, in Broadway, at the head of Dey street. They were making up joints and finishing the connection of some telephone cables in the conduit. To do this it was necessary to use heated paraffin, and while Rockhold was in the hole Johnston had charge of heating the paraffin. He had just handed down a ladle full of the oil, when a drop of water from overhead fell into the ladle and the contents spluttered up and took fire. Knowing that if a fire occurred, it meant instant

death to him and a running blaze all along the line underground, causing many explosions of escaping illuminating gas, as well as sewer gas, Rockhold, quick as a flash threw the heavy ladle up to Johnston. It was impossible for the latter to catch the hot vessel, and to drop back into the manhole again meant to Rockhold the thing he had tried to avoid, so, with rare presence of mind, Johnston kicked the ladle as it emerged from the hole. As he did so the paraffin exploded, some of it spilling into the hole, on Rockhold's face and arms, while a great shower of the hot fluid was thrown into Johnston's face. Neither man knew how badly he was burned, but they went to a nearby drug store, where their wounds were temporarily dressed, and they made haste to reach the Hudson Street Hospital. There they were treated by Surgeon Richardson, who said it was remarkable that both of Johnston's eyes had not been burned out by the hot paraffin.

Work will begin immediately on the new telephone line to be built from Washington to Maybent, for which the contract has been let to Charles Belden, says the Nevada City (Cal.) Herald.

Opposition to Chicago Telephone Company.

Serious competition for the Chicago Telephone company is threatened by a syndicate which has secured control of the ordinance of the Illinois Telegraph and Telephone company, now before the Chicago City Council. Charles H. Aldrich, who represents the promoter, assured the committee to which this ordinance was referred that a company would be formed immediately, and the work of establishing an independent system begun as soon as the franchise was granted.

The ordinance for the Illinois Telegraph and Telephone company was introduced in the council on June 27th by Alderman Novak and referred to the committee. It offers a 50-year franchise to operate a telephone system in all the territory comprised within the limits of the city of Chicago, with the provision that in the district bounded by North and Ashland avenues, Thirty-ninth street and the lake the wires shall be underground. The maximum charge which can be made for the use of a telephone is \$85 a year, and the company binds itself to furnish the city telephones for the various offices in the city hall free, and charge \$5 a year each for all other telephones it may use for fire and police purposes. The committee recommended the ordinance substantially as it was introduced.

Mr. Aldrich directed attention to the fact that while the ordinance under which the Chicago Telephone company is operating specifies that the maximum rate for service in Chicago shall be \$125 per year, the company really charges \$175, as the old system for which the franchise rate is charged is so defective that it is of no commercial value whatever. His company proposes to introduce a complete metallic up-to-date system that will excel the Bell service, he claims, and charge only \$85 per year. Mr. Aldrich also said that the company would include several St. Louis capitalists who are now interested in the Kinloch company of that city and Cleveland capitalists who are engaged in establishing an independent system in that city. From this it is inferred that the company has been formed by Milo G. Kellogg and his associates, although Mr. Aldrich refused to reveal the identity of the men whom he represents. The ordinance will be considered at the council meeting next Monday evening, it is thought.

Trouble in another form is threatened by Joel M. Longenecker, James A. Quinn, E. P. Barry, Dr. J. E. McFatrieh, James D. Morrison, W. W. Watson and others, who have formed an association with the object of securing legislation to lower telephone rents to \$75 a year. It was reported last week that a bill is being prepared to be sent to Springfield.

No Combination of Telephone Interests Contemplated.

[From the New York Tribune.]

A dispatch from Boston has been printed to the effect that prominent Boston interests were forming a combination of all the telephone companies throughout the country which are opposed to the Bell Telephone company, that a majority of those companies had already agreed to sell out to the new company, and that the People's Telephone corporation of this city had been approached by the promoters of the projected combination, but had not yet decided to come in. It was added that the new combination would probably be conducted in harmony with the Bell company, the effect being the practical doing away with all competition in the telephone business.

The People's Telephone corporation mentioned in this dispatch is the company organized a few months ago through the efforts of leading representatives of the New York Board of Trade and Transportation and other mercantile bodies in this city, to furnish a telephone service here which should be more efficient and less costly to subscribers than that given by the Bell Telephone company.

Ex-Congressman Darwin R. James, president of the Board of Trade and Transportation, is also the president of the People's Telephone corporation. He said yesterday afternoon that the report that the People's Telephone corporation had been approached on the subject of entering a combination such as was described in the Boston dispatch was entirely without foundation.

Mississippi Valley Telephone Company

The Mississippi Valley Telephone company has 7,000 subscribers in Minneapolis and St. Paul, and the Bell company has only 5,000. The Mississippi Valley company expects to increase its list to 12,000. The company's headquarters are at Minneapolis. The company has six exchanges working at the present time in Keokuk, Fort Madison, Burlington, Muscatine, Minneapolis and St. Paul. In the last two towns all the lines are underground. In Fort Madison and Muscatine exchanges the American telephone is used, in Burlington the Western Telephone Construction company's instruments, and in the rest the Stromberg-Carlson apparatus. The company expects to extend the long-distance lines all over Iowa in the spring. On the whole the exchanges are increasing right along. In Keokuk, for instance, the subscribers number about 450 at present, while the Bell company has only about 175.

Single-phase, Alternating-current Motors in St. Louis.

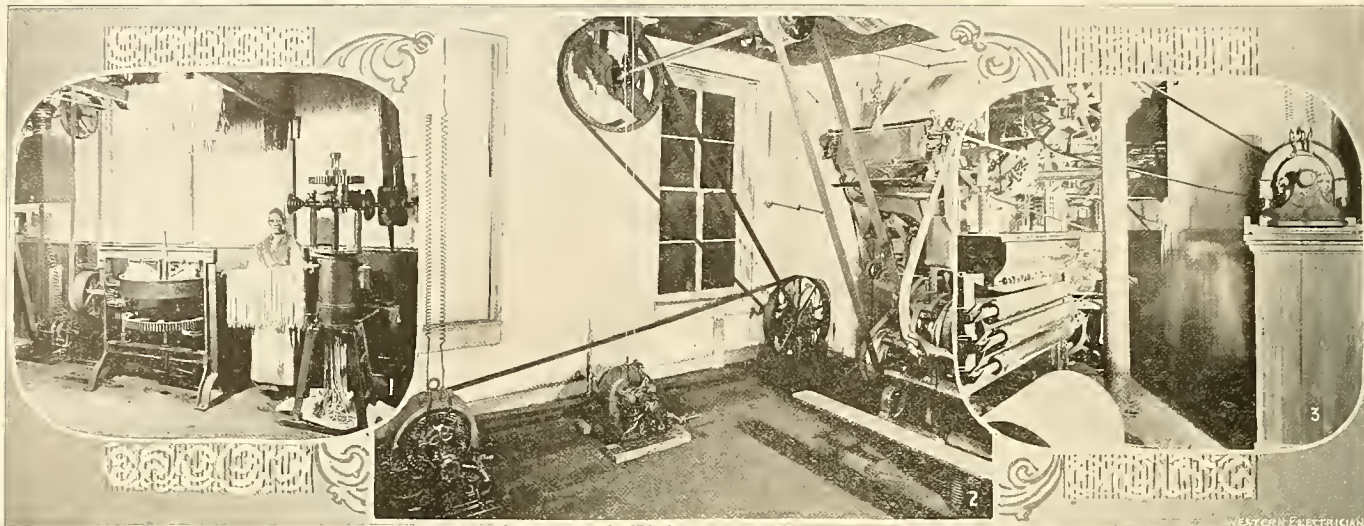
During the last few years the introduction of multi-phase electrical systems of power distribution has made such progress that there are many central-station men who do not appreciate the extent to which the single-phase, non-synchronous, alternating motor has won its way into popular favor. In 1896 the Wagner Electrical Manufacturing company of

the result that there are at present installed several hundred of these single-phase motors in all sections of the world. It would be impossible in a single article to enumerate all the uses and special applications of this apparatus, but it will be interesting to note the adoption of the Wagner company's type by power users in St. Louis alone.

There are now in service in the city of St. Louis about 160 of the Wagner company's single-phase motors, ranging from one to 20 horse power capacity

of the current supplied is now 60 cycles per second. The power consumption is recorded upon recording wattmeters, there being quite a number of types of meters in use.

The Wagner company's motors for installation in St. Louis are so wound that they may be connected for either a pressure of 208 or 104 volts, depending on the requirements of the immediate installation. They operate with equal satisfaction and efficiency on either voltage, but it is obviously



1. Motor Driving Macaroni Factory.

2. Motor Driving Type-setting Machine.

3. Twenty-horse Unit Driving Section of Press Room.

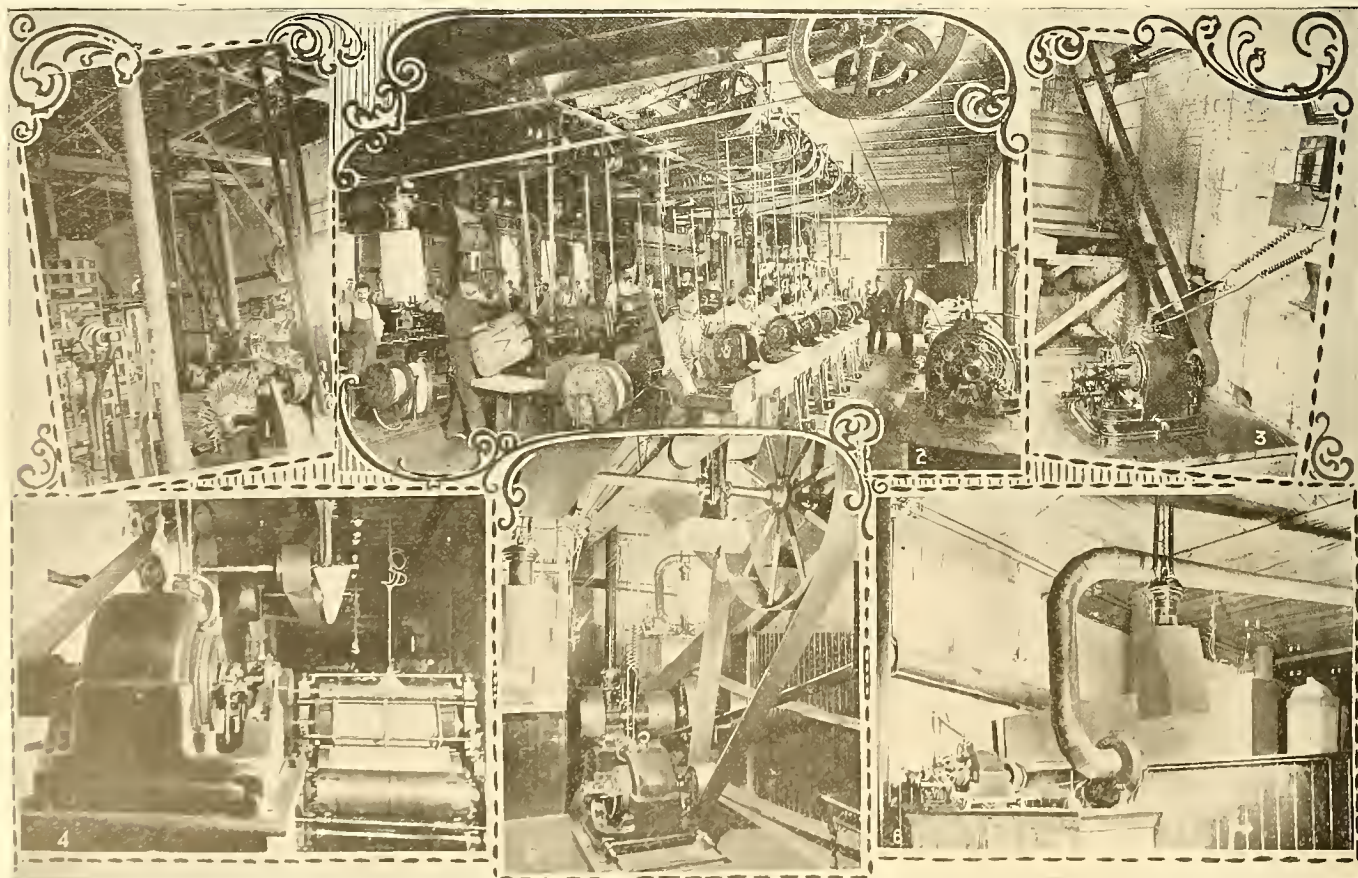
SINGLE-PHASE, ALTERNATING-CURRENT MOTORS IN ST. LOUIS.

St. Louis, a pioneer in this field, began commercially to introduce its non-synchronous type of single-phase, alternating-current motor, and it has since steadily progressed in the manufacture of this type of machine, adding such improvements as experience suggested.

The first single-phase motors of this type built by the Wagner company were installed in its fac-

each. These motors are all fed from the alternating-current circuits of the St. Louis central stations. In the underground district, where there is a low-tension, three-wire network, the motors take their current, in the greater number of instances, from the 208-volt outside wires of the three-wire system, no transformer being necessary for the motor installation. Where the three-wire system is not carried

of advantage to operate these machines from 208 volts, if possible, especially where the motor is installed at considerable distance from the entrance point of the current-supply mains to effect the greatest economy in the cost of wiring. It may be said incidentally, however, that there is nothing in the construction of the motor to prevent its operation from any other pressure of current supply,



1. High-Speed Motor Driving Machine Shop.

2. Five Horse Power Motor Driving Section of Winding Department, Wagner Company's Factory.

3. Seven Horse Power in Shirt Factory.

4. Two Horse Power Motor Driving High-speed Hoe Printing Press.

5. Fifteen Horse Power Motor Driving Press Room Plant.

6. Two Horse Power Motor Driving Blower for Pneumatic Tube System.

SINGLE-PHASE, ALTERNATING-CURRENT MOTORS IN ST. LOUIS.

tory at St. Louis in order that they might be subjected to a thorough and practical test before any extensive effort was made to place the motor upon the market. A number of these first motors are still running with heavy loads in the Wagner company's shops, and to succeed, but the original design proved that it has not been found necessary to make any alterations in the original motors. A little over a year ago this company began to push its alternating-current, single-phase machine throughout the United States and foreign countries, with

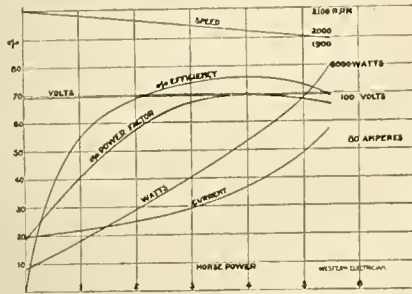
into the building, but a two-wire branch only, the motors are operated on 104 volts direct, without transformers. In the outlying districts, where the current distribution is at a pressure of 1,000 or 2,000 volts, depending upon the distance from the central station, the motors are supplied from the secondaries of step-down transformers. Where incandescent lights are not used, a special transformer for the motor is installed; but where lights are required, the motor is connected to the lighting mains on the secondary side of the transformer. The frequency

and it is the practice of the Wagner company to wind the motors for any voltage specified by customers up to 500.

The advent of the successful single-phase motor has been a great boon to the small power users in the city of St. Louis, as the alternating-current mains have covered the entire city practically, and the direct-current mains were only available in very limited portions of the city. Since the introduction of these motors, therefore, small factories, regardless of location, have been able to secure power

service from the central stations, and the result has been that a great many power users have been added to the list of customers of central stations, thus providing the central stations a very rapidly increasing day load, a feature of central-station business to which a great deal of attention is at this time being paid all over the country.

These motors are being used for almost every conceivable kind of service, from the operation of the entire mechanical department of a daily newspaper to the driving of general machinery, candy factories, pressure blowers, etc. To give the reader a better idea of the great variety of uses to which this type



SINGLE-PHASE, ALTERNATING-CURRENT MOTORS IN ST. LOUIS.—16,000 ALTERNATIONS.

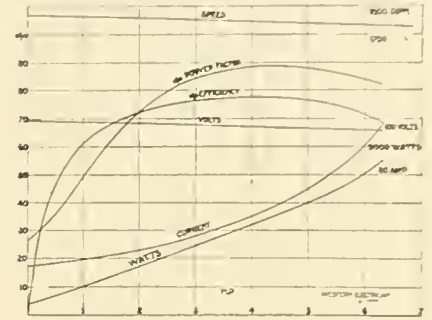
of motor is put, a representative of the Western Electrician recently secured a series of photographs, which are presented in the accompanying composite cuts. In one of these is shown a seven horse power motor, supplying the power used in a shirt factory. As will be seen, the motor is belted direct to a system of countershafting, from which the factory machines are operated. The load is a changing one, varying from about 2½ to 7½ horse power, the motor fully taking care of all fluctuations between these limits. Another view illustrates a motor installed in a macaroni factory. This is one of the smallest motors built by the Wagner company, being rated at two horse power. It carries a load of about 2¼ horse power. Most satisfactory results are secured in what is considered a very careful process of manufacture. Probably the most exacting work which a power motor is called upon to perform is that of operating high-speed printing presses. The most complete and successful installation of Wagner company's motors for this character of work is that in the printing office of the Westliche Post, one of the daily papers of St. Louis. In this plant there are seven motors, ranging in capacity from two to 15 horse power each. Prior to the installation of the Wagner company's motors the plant was operated by steam. Through the introduction of the alter-

of the current supply, and an almost absolutely constant rate of speed has been secured. Views of motors operating portions of the Westliche Post plant are shown. Other work done by these alternating-current motors in the printing offices is the operation of linotype machines, elevator, pneumatic tube message delivery system, etc. The total installation in this office is about 60 horse power. The plant has been in successful operation for about nine months. In the view showing a motor operating a machine shop, the motor is used to drive all of the machinery and carries a heavy friction load in the shape of a large system of countershafting. The motor operates continuously for a period of 10 hours daily, with a practically constant load. In another view is shown a motor operating a portion of the Wagner company's factory. Here the friction load thrown upon the motor in starting is probably as severe as could be found in any character of service, and it was to test the motor under this condition that it was installed in this department of the factory. In addition to the friction load of the complicated shafting system, there is also a heavy fly-wheel on the main shaft, which assists in carrying over sudden fluctuations in load, which adds much to the severity of the starting conditions. The load on the motor is about 6¼ horse power continuously, the motor being rated for five horse power. The mechanical operations performed in this department are such as to throw sudden and very severe loads upon the motor. An interesting application is a 20-horse power motor, driving a 72-inch Sturtevant blower. This class of work opens a great field for this type of motor. It is also a character of work which the motor will be called upon to perform in operating pumps. The starting load comes on gradually, increasing to the full operating load as the combination approaches full speed. No trouble whatever is experienced in starting with the full blower opening.

Without going further into the details of the individual installations, it will be of interest to furnish a general description of the Wagner company's motor:

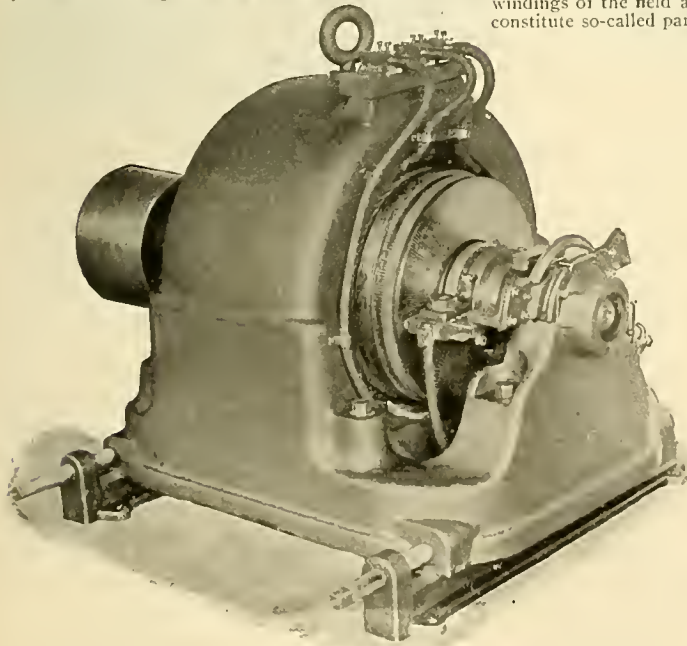
In general appearance these motors correspond very closely to many of the standard types of multipolar direct-current machines on the market. The motor is built on neat lines and with a view to mechanical as well as electrical perfection. The workmanship is of the highest grade, and durability as well as efficiency has been attained. The motors differ radically, however, from motors of the direct-current type in their internal construction. As is the case in all alternating-current motors, the fields are built up on sheet-iron plates circular in form, with slots punched on the inner periphery. These plates are carefully annealed and japanned to cut down internal losses, which would otherwise arise from the generation of eddy currents in them. The windings of the field are threaded into the slots and constitute so-called pancake-shaped coils. The num-

object of this clear. When the line is connected into the two outside binding posts, as indicated, the entire field winding of the motor is used, and the connections are such as to use the motor at its rated capacity both for starting torque and load. If for any reason an abnormally large starting torque is required, or if it is desired to operate the motor so that it will safely carry very suddenly applied excessive loads, the feed-wire connections are changed as to make use of the middle and left-hand binding posts. When so connected the motor will operate with about 25 per cent. of additional starting torque, and an additional maximum load capacity of about 25 per cent. This third terminal is so



SINGLE-PHASE, ALTERNATING-CURRENT MOTORS IN ST. LOUIS.—7,200 ALTERNATIONS.

arranged as to cut out a few turns of the field winding of each of the field coils, and is termed by the Wagner company the "loop" connection. The cast-iron portion of the frame is merely a shell into which the built-up field is slipped from the bottom, being held in position by a cast-iron follower. The armature of the motor, as in the case of the fields, is built up on sheet-iron plates mounted upon a spider, teeth being punched into the outer periphery. The form of winding upon this armature exactly corresponds to that of the ordinary direct-current motor, the coils being placed on the core progressively and connected to the commutator in exactly the same way as would be the winding of a direct-current motor armature. The commutator of these armatures is of the radial type, and is annular in form, the armature winding connections being made at the outer end of the segments. The hole in the center of the commutator is made large enough to admit of the entrance into it of a short-circuiting device, which moves parallel to the shaft and is operated by a sliding sleeve on the shaft. This device, furthermore, is so designed and constructed as to be operated by a pair of governor weights contained in the armature core, the idea being that these governor weights will, when the centrifugal force is sufficient, throw out, and



General View of Motor.

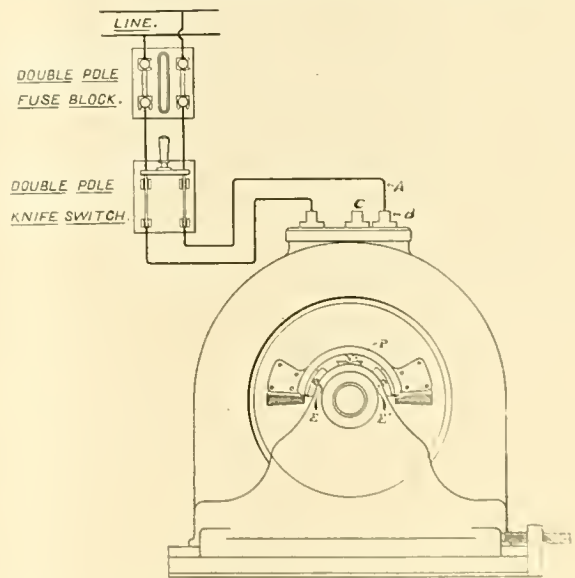


Diagram of Connections.

SINGLE-PHASE, ALTERNATING-CURRENT MOTORS IN ST. LOUIS.

nating-current motors the Westliche Post has been able to effect a saving of at least 33 1-3 per cent. in the cost of operation of its mechanical department. Further than this, the publishers have been able to make the plant a model of neatness and cleanliness by doing away with all the dirt, moisture, etc., incident to the operation of a steam plant, and it is stated that the results secured upon the printing presses are more satisfactory than they were able to derive from the steam-driven plant. It is a very essential condition in the successful operation large, automatic, high-speed presses, that there should be a flow of ink to the rollers bearing a certain ratio to the speed of operation. With alternating-current motors, the speed variation is largely dependent upon the frequency rather than the voltage

ber of poles in the motor depends upon the speed desired and the frequency of the current supply, the speed very closely approximating the number of alternations per minute divided by the number of poles. This form of winding of the field coils is such as to give a maximum strength to the middle tooth of the pole, the strength of the pole gradually diminishing in either direction from this central tooth. All of the windings of the poles are connected in series or in parallel, as conditions of terminal voltage shall demand. The Wagner company makes it a practice to bring out three ends from this field winding to a terminal board located upon the top of the motor frame. The accompanying diagram, which illustrates the method of connection of the motor into circuit, will make the

push the short-circuiting device into the central hole of the commutator. The governor weights fit close to the shaft and move radially. The force resisting the action of these weights is a spiral spring located between the commutator and the front bearings. When the centrifugal force is such as to overcome the resistance of this spring, the governor weights fall outward from the shaft and move the sleeve, which guides the short-circuiting ring forward on the shaft. The other mechanical details of the motor are much the same as in the Wagner standard direct-current motors. The bearings are long and substantial, being of phosphor-bronze and with self-oiling rings. A noticeable feature of the alternating-current motors built by the Wagner company is the uniformly heavy shaft to be found in all

sizes. As will be seen by referring to the general view of the motor, there is a set of carbon brushes running on the commutator. The holders of these brushes are so mounted as to be also controlled by the governor weights, being fixed to a frame that is so mounted upon the front pillow block as to permit of the motion parallel to the axis of the shaft, and of sufficient magnitude to bring the brushes entirely clear from the surface of the commutator when the governor weights are thrown out. In other words, at the instant when the short-circuiting ring slips into the commutator the brushes are thrown off the commutator surface. The brush holders are also so carried that they may be revolved on the commutator shaft their position upon the commutator surface being thus regulated. In the mechanical construction of the motor the clearance between the armature and field is made as small as practicable in order to hold down the reluctance of the magnetic circuit to the smallest possible amount. In its general appearance this type of motor is really a transformer, in which the field winding corresponds to the primary winding of the transformer and the armature winding to the secondary of the transformer. The alternating current, which is sent from the supply circuit into the field winding, generates by induction alternating currents in the armature windings. By means of the brushes running upon the commutator the direction of flow of these armature currents is so controlled as to create a magnetic polarity in the armature of sufficient angular displacement from the polarity of the field to produce the necessary revolving action. At the instant of starting the carbon brushes may be closed by a short-circuiting connection between them, or may be closed through an external resistance. When the current is first turned into the field winding the motor starts off with a very large starting torque and very quickly runs up to the operating speed. Just before attaining the operating speed the governor weights perform their function of pushing in the short-circuiting device and throwing off the brushes. When this action takes place, the commutator is thrown entirely out of service, save that of a mere short-circuiting medium for the armature winding. The direction of the rotation of the armature can be completely controlled by the position of the carbon brushes upon the commutator surface. The starting torque and starting current may also be controlled through wide limits by adjustment of the position of the carbon brushes. The torque characteristic of the motor is practically the same as that of a series direct-current motor, the maximum torque being at the first instant of starting and decreasing as the motor runs up to speed. On attaining the operating speed the motor runs with remarkably uniform speed, varying in extreme cases not more than eight per cent. between full load and no load. The conditions at full speed are such as to permit of a very high armature efficiency, there being no brush friction and very little armature resistance. It is found in operation that the wear upon the commutators of these motors is practically negligible, and one of the most satisfactory features in connection with the operation of the motor has been the small amount of attention which they have required.

The operating curves of these motors, shown herewith, are the results secured upon the five horse power automatic size, in one case operating on 60 cycles, and in the other operating on a 16,000 alternation circuit. It may be stated that these curves do not show the maximum load capacity of the motors, a 60-cycle motor being capable of carrying for short intervals 50 per cent. overload, and a 133-cycle motor being capable of carrying, for short intervals, about 33 1/3 per cent. overload. It is interesting to note the excellent efficiency secured, and also the remarkable power factor.

As indicating further the operating results that are being secured with these motors, the following table of sizes, approximate full-load current, full-load efficiency and transformer capacity is presented:

MOTORS FOR 60 CYCLES.							
Horse Power	Approximate Full Load Current in Amps	Full Load Efficiency	Watts Idle	Speed.	Approximate Shipping Weight.	Transformer Capacity Required.	
1	21	75	150	1,750	275	1 1/2	K.W.
2	44	77	240	1,750	490	3	K.W.
3	62	79	290	1,750	550	3	K.W.
4	77	80	350	1,750	660	4	K.W.
5	91	81	400	1,750	750	5	K.W.
6	104	82	450	1,750	850	6	K.W.
7	117	83	500	1,750	950	8	K.W.
8	130	84	550	1,750	1,050	10	K.W.
9	143	85	600	1,750	1,150	12	K.W.

MOTORS FOR 133 CYCLES.							
Horse Power	Approximate Full Load Current in Amps	Full Load Efficiency	Watts Idle	Speed.	Approximate Shipping Weight.	Transformer Capacity Required.	
1	15	76	110	1,950	275	1	K.W.
2	30	78	200	1,950	490	2	K.W.
3	45	80	290	1,950	660	3	K.W.
4	60	82	380	1,950	850	4	K.W.
5	75	84	470	1,950	1,050	6	K.W.
6	90	86	560	1,950	1,250	8	K.W.
7	105	88	650	1,950	1,450	10	K.W.
8	120	90	740	1,950	1,650	12	K.W.

The Wagner company has received a large number of complimentary letters relative to the utility of their single-phase motor. A purchaser as far away as Melbourne, Australia, sends

in as gratifying a communication relative to a 15-horse power motor as could be desired. It seems that this motor was desired to operate upon three different frequencies of current, ranging between 40 and 70 cycles. Mr. F. W. Edgar, the engineer controlling the installation, in a voluntary communication to the Wagner company, reports that there has not been the slightest hitch from the first time the current was put into the motor to the present, and that the motor starts off with full load in about 1.3-5 seconds. "In all previous motors," continues Mr. Edgar, "supplied from America, England and the continent, there has always been the difficulty of the starting current, which your engineers seem to have overcome. We are therefore able to do away with auxiliary starting gear, which makes a very great saving in the cost of installation."

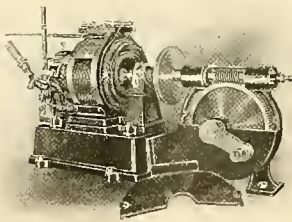
Double Drum Hoist and Electric Motor.

The electric hoist illustrated shows one of the recent applications of a General Electric induction motor to a double independent-drum Lidgerwood mine hoist. It is compact in form, and the levers controlling the clutches and brakes and the handle of the rheostat are placed in the position most convenient for control by the operator standing on a platform above the floor and having a clear view over the top of the hoist. Each friction drum is driven through a single-reduction gearing by a 100-volt, 12-pole induction motor of 30 horse power capacity, running at 600 revolutions a minute. Each drum is independent and is 42 inches in diameter by 40 inches face. Together they hold about 420 feet of seven-eighths-inch rope. The maximum hoisting speed is 300 feet a minute, and the weight hoisted, i. e., load, car and cage, 2,100 pounds. The depth from which the load is to be hoisted is 400 feet from the surface.

Emerson Organ-pumping Outfit.

The Emerson Electric Manufacturing company of St. Louis has brought out the electric organ-blowing attachment illustrated by the accompanying cut. The device is designed to drive the pumping mechanism of a pipe organ and to automatically regulate the supply of air.

The system is designed primarily for operation



EMERSON ORGAN-PUMPING OUTFIT.

on alternating currents, but its simplicity and compactness and the ease with which it can be installed recommend its use with any kind of electric current.

The outfit shown consists of an Emerson single-phase alternating-current motor of one horse power, arranged with triple-worm gear to directly transform the revolutions of the motor (1,800 per minute in this case) into the reciprocal crank motion required for an organ pump (45 strokes per minute in this case).

It eliminates the necessity of all pulleys, belts, countershafts, etc., and is furnished to meet the exact requirements, as to length of stroke and strokes per minute which may be required to meet the necessities of various organs.

In this system the motor is started and left running (at a constant speed) while the organ is in use, and would be left running during an entire service or concert. The only disadvantage to this is the amount of current used while the pump is not in operation, but as this amounts to only 1.3 cents an hour on a one horse power motor with a rate of 10 cents a thousand watts, it is of no great consequence, and, in fact, is largely compensated for by the absence of extra current in starting several times. No regulating rheostats are needed, and there is no sparking of contacts on stoppage and starting.

The operation of this outfit is as follows. The motor is started by the handle marked "motor-starting handle," and as the bellows of the organ is presumably empty, the friction clutch shown at the other end of the motor shaft is in contact with worm disk, and the motor begins pumping air into the air reservoir until filled. The natural rise of the top of the air reservoir, to which the chain marked "connection to bellows" is attached through pulleys or crank-bells, will release the friction disk when filled to any desired point, and the pump mechanism will stop, leaving the motor running free and thus taking almost no current. As soon as the air reservoir begins to empty, this will allow the clutch to operate again, and supply as much or as little air as may be necessary to keep the reservoir full or well supplied with air.

The action of the friction disks is positive and noiseless. The worm is of hardened steel. The worm-wheel is run in a bath of oil, and is therefore

perfectly lubricated at all times, and the entire outfit is manufactured in a workmanlike manner to stand hard and continuous service with little or no attention. The action of the clutch may be controlled so as to pump fast or slow, and to change speed as the air reservoir fills, by merely making a spring connection between air reservoir and motor instead of solid connection, but the manufacturer advises a solid connection whenever practicable, as there is then very little or no wear on the friction clutch.

Yerkes Street Railway Properties.

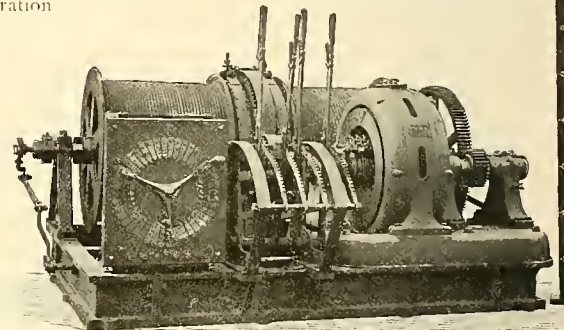
The annual meetings of the North and West Chicago Street Railroad companies and the Lake Street Elevated Railroad company were held at Chicago on January 10th. Favorable reports were received from all of these properties, the old directors and officers were elected for the ensuing year, and general satisfaction was expressed with the policy adopted by the management.

The report of the North Chicago Street Railroad company contained the following information:

The receipts from all sources were.....	\$3,015,323.01
Against (for the previous year).....	2,911,552.41
Showing an increase of.....	103,770.60
The operating expenses amounted to.....	1,390,680.93
Against (for the previous year).....	1,319,926.63
Leaving a balance of.....	1,624,642.08
Against (for the previous year).....	1,591,625.78
Or an increase in earnings of.....	33,016.30
After paying fixed charges, including railway rental, taxes, insurance and interest, amounting to.....	543,665.24
There is a balance to the credit of net earnings of.....	1,080,976.84
Being an increase over last year of.....	125,813.79
Out of which there were dividends paid amounting to.....	879,957.00
Leaving a balance to credit of income account of.....	210,019.84

The total earnings on the capital stock amounted to 13.65 per cent. against 14.47 per cent. for the previous year. This difference in percentage of earnings is owing to the increase of capital stock in the early part of last year, the money realized from that increase going to pay former indebtedness. The number of passengers carried, including transfers, was 78,394,660, which shows an average of 3.7 cents a passenger received for each passenger carried.

The West Chicago Street Railroad company reported that the number of persons carried on transfers was 31,315,814, out of a total of 111,916,319 passengers carried. The company has over 200 trans-



DOUBLE DRUM HOIST AND ELECTRIC MOTOR.

fer points. A condensed report of the treasurer follows:

	1898.	1897.	Increase, 1898.
Gross receipts.....	\$4,031,903.93	\$3,899,919.19	\$131,985.74
Operating expenses (50.0 per cent).....	2,017,946.60	1,929,664.48	88,282.12
Profit from operating.....	\$2,013,957.33	\$1,970,254.71	\$43,702.62
Fixed charges, including interest, taxes and rental of leased roads.....	1,108,000.82	1,136,184.79	61,816.03
Applicable to dividends.....	815,956.51	831,058.02	*18,112.41
Dividends paid.....	791,340.00	791,340.00	.....
To income account.....	\$ 24,616.51	\$ 42,728.92	*18,112.41
Percentage on capital stock.....	6.18	6.32	*0.14
Passengers carried in 1898, horse.....	.....	.....	239,249
Passengers carried, electric.....	.....	.....	28,748,138
Passengers carried, cable.....	.....	.....	51,643,118
Total.....	.....	.....	80,600,505
Passengers carried on transfers.....	.....	.....	31,315,814
Grand total.....	.....	.....	111,916,319
*Decrease.			

The Lake Street Elevated Railroad company's business is summarized as follows:

	1898.	1897.	Increase.
Gross business from passengers.....	\$618,326.59	\$561,370.93	\$56,955.66
Advertising, etc.....	.....	18,589.80	*3,512.76
Totals.....	\$633,403.63	\$579,960.73	\$53,442.90
Operating expenses.....	374,947.01	329,241.21	*41,772.23
Extraordinary expense.....	.....	31,880.17	.....
Net earnings.....	\$258,456.62	\$218,956.32	\$39,500.30
Fixed charges, including taxes, interest on floating debt and loop rental.....	335,147.96	291,798.68	133,449.28
Deficit.....	\$ 76,691.34	\$ 72,842.36	*\$4,151.02
*Decrease.			
Average passengers per day, 1897.....	.....	.....	30,766
Average passengers per day, 1898.....	.....	.....	33,948

The operating expense per cent. of earnings was 51.27 per cent. for 1898 as against 56.75 per cent. for 1897. Having regard to which the following may be of interest:

Loop rental.....	1897.	1898.
Maintenance of track.....	\$15,707.20	\$61,953.76
Maintenance of cars and motors.....	7,104.37	9,534.76
Totals.....	26,552.14	72,511.51
Totals.....	\$19,263.71	\$99,000.05

Mr. Yerkes announced the prospective consolidation of the outlying electric roads on the North

and West sides, which are now operated as feeders in connection with the larger systems. The new corporation will be known as the Chicago Consolidated Railway company.

There are nine roads, which may be grouped as follows: The North Chicago Electric, Chicago North Shore, North Side Electric and Evanston electric lines, extending along the north shore from the North Chicago cable terminus to Evanston; the Chicago Electric Traction and Chicago and Jefferson Urban Transit lines, reaching the north-west territory of the city; the Cicero and Proviso, Suburban and Ogden street-railway lines, the former two extending west from the Lake street elevated and West Chicago termini to Austin, Oak Park and Maywood, the latter extending southwest to Clyde, Hawthorne and Lyons.

Mr. Yerkes said that the consolidation would make possible economies in management and operation, which would make the lines more profitable than they have been, and would enable passengers to go from Evanston to Oak Park and other points without passing through the center of the city. No statement was made as to the amount of capital for a central company, but the present capitalization of the nine companies is as follows:

	Stock.	Bonds.	Total.
North Chicago Electric.....	\$2,000,000	\$29,000	\$2,829,000
Chicago North Shore.....	650,000	675,000	1,325,000
North Side Electric.....	1,500,000	155,000	1,655,000
Evanston Electric.....	1,000,000	130,000	1,130,000
Chicago Electric Transit.....	1,500,000	1,097,000	2,597,000
Chicago and Jefferson Urban.....	2,000,000	200,000	2,200,000
Cicero and Proviso.....	2,500,000	1,893,000	4,393,000
Ogden Street Railway.....	1,500,000	576,000	2,076,000
Suburban Railroad.....	1,250,000	1,250,000	2,500,000
Total.....	\$13,900,000	\$6,811,000	\$20,711,000

Of these obligations the following bonds are guaranteed by the North Chicago Street Railroad company: North Chicago Electric, \$649,000; Chicago Electric Transit, \$255,000; North Side Electric, \$155,000. These roads earn the interest, so there is no charge upon the North Chicago road. The West Chicago Street Railroad company guarantees the following amounts: Cicero and Proviso, \$1,289,000; Ogden, \$570,000; Chicago and Jefferson, \$206,000; Chicago Electric Transit, \$842,000; North Chicago Electric, \$180,000. The interest on these bonds also is earned by the respective lines.

CORRESPONDENCE.

New York Notes.

New York, January 9.—The connection of the Western Union Telegraph company with counterfeit money or "green-goods" swindlers, in so far as the company forwards messages from the dupes to the sharpers, has long been a source of complaint by the police. The Hudson County (New Jersey) grand jury took action in the matter, and on Friday reported indictments against the Western Union company and John B. Bertholf, the Jersey City manager, for aiding and abetting the green-goods men. Immediately afterward a capias was issued for the arrest of Manager Bertholf. He was arrested at the company's office, and surrendered to the sheriff. Bail had been fixed at \$2,500, and the required bond being furnished, Mr. Bertholf was released, pending arraignment. The charge is that the company, knowing the messages were addressed to swindlers, forwarded them from Jersey City addresses given as a "blind," and refused to give the police the addresses to which the dispatches were forwarded, or at any rate delayed in so doing. The Western Union company was also indicted by the grand jury of Camden County (New Jersey) on January 6th for violating the 59th section of the Crimes Act, which makes it a misdemeanor in New Jersey for a telegraph, telephone or express company to transmit any communication by cipher or otherwise relating to the drawings of lotteries, policy numbers or other forms of gambling prohibited by the statutes of the state. The maximum penalty is \$2,000 fine and six years' imprisonment.

Manhattan and General Electric made surprising advances last week in the stock market. It was reported that the Metropolitan Street Railway company had made an agreement for control of the Manhattan on the basis of an exchange of stock, but this rumor was denied. Another report was that the Manhattan had awarded to the General Electric company a contract for equipping its system with electricity; and this story, of which neither trustworthy denial nor affirmation could be obtained, seems to have been the main factor in causing the stocks of both companies to go up.

A new labor union has been formed under the title of the Electric Cable Splicers' Union of New York city, and it is said to have been incorporated under the laws of this state "for mutual benefit and social purposes."

Work on the downtown section of the West Side conduit electric system of the Metropolitan Street Railway company will close for the season on January 18th. At that time the Eighth avenue cars, now running to Barclay street, will run as far as Rector street, with a side line to Broadway and Canal street. Next spring the line will be extended to Battery place. The new cars, run by compressed air, will be started on the Twenty-eighth and Twenty-ninth street crosstown lines as soon as the machinery and plant at Thirteenth avenue and Thirty-fourth street are ready. This will be about April 1st.

M. S.

PERSONAL.

James H. Glasier, chief dispatcher of the Delaware division of the Erie railroad, died at his home in Port Jervis, on January 8th, of pneumonia, resulting from grip. He was born at Oriskany Falls, N. Y., about 65 years ago, and was telegraph operator on the Erie railroad at Cochecon when the Civil War broke out. He entered the military service, and was an operator in the Army of the Potomac under General McClellan. He also had the distinction of being General Grant's operator, and was often put by him on the fring line.

L. H. Rogers has retired from the Fort Wayne Lamp Works of Cleveland, of which he was manager, to accept the treasurership of the Oklahoma Cement and Plaster company of Okarche, O. T. The company was organized for the purpose of developing a section of Oklahoma territory that contains an earth that is in reality a cement, fit for use with but little preparation. This property was discovered some years ago, and since it first became known Mr. Rogers and a party of capitalists have been quietly at work organizing to exploit this novel product. The company feels that it has secured all of the so-called cement ground that is located in that immediate vicinity. Mr. Rogers' experience as one of the oldest and best trained men in the electrical business will no doubt prove of great value in the development of this property.

W. R. Mason has been appointed manager of the St. Louis office of the Siemens & Halske Electric company of America. Mr. Mason has had valuable experience as manager and salesman, especially in the street-railway field, and his acquaintance extends to managers and operators of street-railway properties and central stations and lighting plants throughout the country. Mr. Mason represented the Walker company at St. Louis until that corporation was absorbed by the Westinghouse interests, and he succeeded in increasing the business of the Walker company in that district so as to attract the attention of the management and win special commendation. Mr. Mason's friends throughout the country will be pleased to learn of his new connection. His energy, perseverance and intelligent application, together with his wide acquaintance, should prove valuable in his new position.

The Engineer Corps of the navy, through Engineer-in-chief Melville, presented a heavy silver loving-cup to Chief Engineer Walter McFarland, who has resigned from the navy to become assistant superintendent of the Westinghouse companies. The presentation took place at the apartments of Commodore Melville. All the naval engineers now on duty at Washington, as well as a number of friends, were present. The cup was inscribed with Mr. McFarland's name and the following sentiment, proposed by Commodore Melville: "Drink deep the draught of love, the love of your fellow-men." "The retirement of Chief Engineer McFarland from the navy," says the Washington correspondent of the New York Tribune, "furnishes a striking instance of the government's parsimony in the remuneration of men who occupy places of great responsibility. Mr. McFarland, while on duty as Commodore Melville's assistant, in the Bureau of Steam Engineering, disbursed about \$20,000,000 annually. While at sea he had sole control of the engines of ships that cost \$5,000,000 each. His pay was \$2,400 a year, while the Westinghouse companies start him with a salary of \$8,000."

A cable dispatch from London, January 5th, announces the death in that city of Mrs. Clara Jessup Moore, widow of Bloomfield H. Moore of Philadelphia, aged 75 years. It is rather a singular coincidence that simultaneously with the announcement of Mrs. Moore's death the statement is published that evidence has been unearthed at Philadelphia proving conclusively the fraudulent character of the work and claims of the late "Inventor" Keely, in whom Mrs. Moore was greatly interested. It is asserted by Mrs. Moore's friends that her death was hastened by the fact that she became convinced that her confidence in Keely's representations had been misplaced. Mrs. Moore's career, apart from her social activities, was devoted largely to deeds of charity and to literature as a pastime. She wrote stories and poems under the pseudonym of Mrs. Clara Moreton. Her favorite theme was the independence of woman. Mrs. Moore became interested in the labors of Keely and became a believer in his claim to have discovered an unknown etheric force. Through her munificence Keely was supported in the progress of his alleged investigation for several years. She wrote a paper in 1885 on "Ether, the True Protoplasm." Three years ago Mrs. Moore entered into an agreement to supply Keely with more funds, on condition that Professor Lascelles-Scott of London should be permitted to examine his laboratory work and become the custodian of his secret. For a time Keely seems to have deceived Professor Scott, but after a short stay in Philadelphia he departed and Mrs. Moore publicly announced that her agreement with Keely was abrogated. Mrs. Moore was married in 1842. Her husband died in 1878, leaving an estate valued at nearly \$6,000,000, of which Mrs. Moore and her only son, Clarence B. Moore, who now resides in Philadelphia, were appointed executors. Besides her son, Mrs. Moore had two daughters, the elder of whom, Ella Carlton, married Count Carl Gustav von Rosen of Sweden, and the younger, Mary, mar-

ried the Baron Carl von Bildt, a son of a former secretary of the Swedish legation at Washington.

TRADE NEWS.

The Emerson Electric Manufacturing company of St. Louis, Mo., has recently perfected a device by means of which church organs can be operated with alternating-current motors, and requests correspondence from all persons interested in this class of apparatus. This device has been perfected in response to inquiries covering a number of years and is now placed on the market by the Emerson company, as it believes it is a thoroughly practicable and efficient device. The company will be pleased to send descriptive circular and prices to the electrical fraternity upon request. In corresponding about the organ-blowing outfit ask for circular No. 2007.

Mr. H. W. Wiswell, electrical engineer, formerly with the General Electric company, and who has been for the last year associated with the New York and Ohio company as manager of the transformer department, and who is stated to have designed the model '98 transformer of that company, makes the announcement that he has resigned his position with that company, his contract having expired, and has associated himself in a similar capacity with the Warren Electric and Specialty company, Warren, O. This company will place upon the market the new Peerless transformers, which, it is claimed, will be a distinct improvement upon anything now on the market, and expects to be able to make deliveries about April 1st.

The Electric Appliance company has prepared for distribution to the telephone trade a sample card of the celebrated Parante wires particularly adapted to telephone uses. The card shows samples of No. 19 plain and braided single-conductor Parante of a high insulation, suitable for telephone work. It also shows samples of No. 19 duplex twisted Parante wire in three styles, the first being plain with one conductor of red rubber and the other with black rubber insulation; another sample with black and red rubber insulation, but braided over with a regular saturated weatherproof braid. There is still another sample of the No. 19 two-conductor twisted having red and black rubber insulation, but having glazed braid instead of the saturated braid. These sample cards can be had for the asking.

The Warren Electric Manufacturing company of Sandusky, O., has appointed J. Holt Gates & Co. general agents for its apparatus in the territory surrounding Chicago. The company has recently placed, through this agency, a 15,000-light alternating-current plant for the new power and light plant of Armour & Co., at the Union Stockyards, Chicago. This plant will consist of one machine of 7,000 (16 candle power) lights capacity, at 1,000 volts and 7,200 alternations, and two 3,600 lighters. These alternators are of the inductor type, and will be operated by rope drive from Corliss engines of 2,000 horse power and 1,100 horse power each, to which will also be attached Walker direct-connected power generators. It is stated that the Warren alternators were selected on account of their close regulation, high efficiency, low temperature and ability to stand "grief." The Warren Electric Manufacturing company is now prepared in its new factory to build 10,000-light machines, both single and two-phase. It has over 60 machines on order at the present time.

BUSINESS.

The Ball Engine company, Erie, Pa., will furnish the engine to be used in the electric-light plant being erected by the Seckner Contracting company at Churubusco, Ind. It has also sold a 165 horse power engine to the Flint and Pere Marquette Railway company, to be used for electrical purposes.

As an indication of the appreciation with which the trade regards the Twentieth Century catalogue, issued by the Central Electric company, which is daily in receipt of testimonials, two extracts are given:

We hereby acknowledge the receipt of your grand general catalogue and discount sheet. Please accept our thanks for same, and when in need of any material will send in our order.

We beg to acknowledge receipt of the copy of your new catalogue, and wish to compliment you on this very elegant publication. It is a credit to your firm, and we hope will be the means of largely increasing your business. It certainly will prove of great value to all purchasers of electrical supplies, as it seems to be nearer perfect than anything in this line heretofore published.

Charles H. Besly & Co., 10 and 12 North Canal street, Chicago, manufacturers and dealers in machinists' hardware, report a very successful business for the year 1898. A decided improvement was noted in the demand for the specialties of their own manufacture, viz., taps of every description, Badger and Gardner die stock, Helmet sheet bronze and wire ton springs, parallel clamps, Perfection and Bonanza oil cups, Gardner grinders, Helmet solid oil and Mannocitin, a rust preventive. Among foreign orders for this material may be noted shipments to England, Russia, France and India, Brazil, Argentina, Uruguay, Chile, Peru and Bolivia. There were large shipments to the jobbers and manufacturers in this country. The firm's factory at Beloit, Wis., is being run full time, and Besly & Co. regard the outlook for the future as very bright.

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued January 3, 1899.

616,879. Electromechanical Gong. Clarence E. Beach, Binghamton, N. Y. Application filed May 14, 1896.

A magnetically controlled releasing device, a revolvable part provided with projections capable of engaging with a portion of the releasing device, a gear moving with the revolvable part, a pinion engaging with the gear and with an internal gear, and a striking mechanism operated by the movement of the pinion around the axis of the gear.

616,891. Electrolytic Apparatus for Treating Metals and Ores. George D. Burton, Boston, Mass. Application filed July 19, 1897.

A tank is provided for containing an electrolytic solution, an anode and a cathode disposed therein and connected to a suitable source of electricity, a hopper disposed over the tank, a material feeder for feeding the material to be treated into the hopper, and a perforated electrolyte feeder for feeding an electrolyte into the hopper in conjunction with the material, whereby the infowing material is acted upon by the infowing electrolyte and thoroughly distributed throughout the tank, thereby preventing clogging of the material and facilitating thorough action of the electrolyte thereon.

616,906. Electric Furnace. James A. Deuther, Boston, Mass. Application filed June 2, 1897.

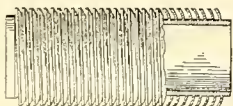
In an electric arc furnace there are two opposite electrodes, a feed mechanism, a regulator operating independently of the feed mechanism and located adjacent to the anode for receiving the material to be treated from the feed mechanism and for supplying the same to the arc, and means for operating the regulator.

616,953. Telephone Receiver. James J. Mulconroy, Philadelphia, Pa. Application filed May 7, 1898.

A cushion for a telephone receiver is composed of yielding material, and constructed as an annular body of approximately semi-cylindrical transverse section, the outer edge of which is adapted to grasp the rim of a receiver, the inner edge of which is adapted to rest freely or unsecured against the end face of a receiver, forming an air cushion between its inner and outer edges.

616,956. Electromagnetic Brake. Frank C. Newell, Chicago, Ill. Application filed February 5, 1898.

Two electric motors are employed for driving a car, and an electric circuit, independent of the motor circuit, connects the field of each motor in series with the armature of the other. The independent circuit is normally open and has terminals, circuit closers operative at will to engage the terminals to close the independent circuit and thereby convert the motors into generators operated by the inertia of the car in motion, and an electromagnet track-brake device in the independent circuit supported with its poles extending to engage a track rail forming its armature.



NO. 617,003.

616,978. Storage Battery. Friedrich W. Schneider, Triberg, Germany. Application filed December 3, 1896.

A supporting frame consists of a series of insulating troughs arranged one above the other and having perforated side walls; trough-shaped current conductors are inserted in the trough and have projections on their inner surface, and active material is filled in the current conductors.

616,979. Means for Cooling Dynamo-electric Machines. Georg W. von Siemens and August W. H. Roth, Berlin, Germany. Application filed October 22, 1898.

Claim is made for the combination with the casings forming approximately to the exterior surfaces of the enclosed parts but separated therefrom, whereby lateral air passages are provided in the machine, of means for effecting the rapid flow of air currents laterally through the air passages, whereby the surfaces of the machine are cooled.

617,002. Means for Producing Battery Electrodes. Theodore A. Willard, Norwalk, Ohio. Application May 4, 1896.

A cutter for producing battery electrodes from metallic plates has a cutting edge at an inclination to a vertical plane and gradually sloping from its highest to its lowest cutting point, and having a flat-bottom bearing surface inclined laterally to ride on the plate, and an inclined top surface at a different inclination from the bottom surface to turn the leaf.

617,003. Tubular Electrode for Storage Batteries. Theodore A. Willard, Cleveland, Ohio. Application filed January 26, 1897.

An electrode circular in cross-section, hollow through the center and having a series of annular ledges from top to bottom, uniform in cross-section from edge to base and having uniform spaces between them, and curved outward and upward from their base, is described.

617,004. Storage-battery Electrode. Theodore A. Willard, Cleveland, Ohio. Application filed January 26, 1897.

An electrode for batteries has a succession of shelves, one above the other upon its outside and a hollow body closed across its ends to exclude liquid, and a stiffening core of a different material in the body within the ends.

617,010. Timing Apparatus for Trolley-railway Systems. Herby Garrett, Dallas, Tex. Application filed April 19, 1898.

Timing apparatus of the class described having an insulating device with electromagnetic controlling mechanism, includes a trolley circuit closer comprising a pivotal trip arm adapted to normally rest on top of the trolley wire and provided on its inner side with a longitudinal wire groove and an arched contact plate spanning the groove and the wire therein, and having a circuit wire connection with the electromagnetic controlling mechanism.

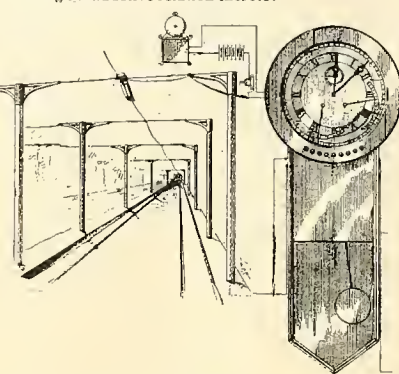
617,024. Electrolytic Reducing and Amalgamating Sluice. Joseph H. Jory, San Francisco, Cal. Application filed May 27, 1897.

A reducing and amalgamating sluice having a series of closely adjacent plates with contracted passages there-

between, electrical connections for alternately charging the plates positively and negatively respectively, and a fibrous or similar protective covering incasing the alternate positive plates, to prevent direct metallic contact of the adjacent plates.

617,067. Helix for Electrical Apparatus. John T. Williams, New York, N. Y. Application filed April 3, 1895.

One claim is for a combined electromagnet and condenser, the condenser having for one of its plates the winding of the electromagnet, for the other a second conductor interposed between the several convolutions of the winding in inductive relation thereto.



NO. 617,010.

617,009. Electromagnetic Apparatus for Actuating Mechanism. Samuel H. Hoggson, Chicago, Ill. Application filed August 4, 1897.

In an electromagnetic apparatus for actuating mechanism the combination of a ratchet wheel, a lever fulcrumed at an intermediate point of its length and carrying a weight at one end and having a pawl engaging the ratchet wheel to rotate the same on the descent of the weighted end of the lever, an electromagnet arranged below the fulcrum of the lever, the electrical circuit thereof, an armature arranged in proximity to the electromagnet, a spring for raising the armature, a pitman connected to the armature and loosely connected to the unweighted end of the lever so as to enable the lever to move independent of the pitman and vice versa, and a circuit maker and breaker actuated by the descent of the weighted arm of the lever to close the circuit.

617,114. Electric Motor. Charles R. Meston, St. Louis, Mo. Application filed July 9, 1898.

The combination is described of a fixed shaft depending from a motor frame, an armature mounted on the fixed shaft, fan blades mounted on the armature, suitable bearings for the armature, a housing for the bearing, and a switch for the motor circuit, which switch is mounted on the housing.

617,121. Apparatus for Electric-current Supply, etc. Edwin J. Preston and Arthur B. Gill, London, England. Application filed December 29, 1897.

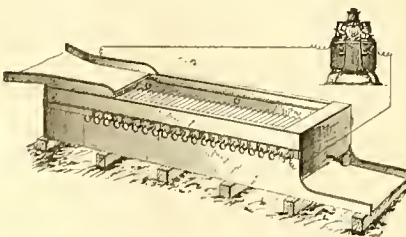
The arrangement comprises a dynamo, two storage batteries, a charging circuit and a service circuit, and connections between the circuits and batteries, of a contact lever which is automatically moved into contact by the starting of the dynamo and out of contact by the stoppage of the dynamo, and a switch for altering the connections between the storage batteries and the charging and service circuits, which is automatically shifted by the contact lever upon the starting and stopping of the dynamo.

617,128. Electric Elevator. Alonzo B. See, Nils O. Lindstrom and Daniel A. Mason, New York, N. Y. Application filed April 26, 1898.

An electric elevator comprising hoisting machinery, a polyphase electric motor for controlling the machinery for either direction of travel, branch circuits representing each current phase extending along the elevator shaft, switches accessible to an operator controlling the branches, and a governor operated by the movement of the apparatus for reversing the phases with respect to the motor terminals.

617,139. Electric Block System for Railways. Hamilton Baluss, Jr., Wayne, Mich. Application filed December 31, 1897.

A system comprising a railway is provided with a trolley wire for supplying current thereto, a plurality of stations at which the trolley wire is bent aside and run parallel with the main line, two insulated sections of detached trolley wire occupying the gap in the main line made by turning the main wire aside, a switch at one station operated by a moving car for disconnecting the current from a detached section in advance of a car, and a switch operated by a passing car, to disconnect the current from a detached section at a station in the rear of the car.



NO. 617,024.

617,145. Telephone-exchange Switch and Signal Apparatus. William W. Dean, Boston, Mass. Application filed March 19, 1898.

A compound telephone circuit extends from one substation to another through a central station and comprises the individual exchange circuits of the substations; switchboard connections uniting their central station ends; a bridge at the central station containing a source of current, and dividing the switchboard connection into two terminal sections; an impedance coil in one of the terminal sections; a shunt circuit round the impedance coil; a condenser in the shunt circuit; and a repeating induction coil having its windings included in the other terminal section and the shunt circuit respectively, the impedance and induction coils being organized with magnetic cores and armatures to form signal-controlling relays.

617,165. System of Electrical Distribution. Samuel Kirlin, Watertown, S. D. Application filed August 18, 1898.

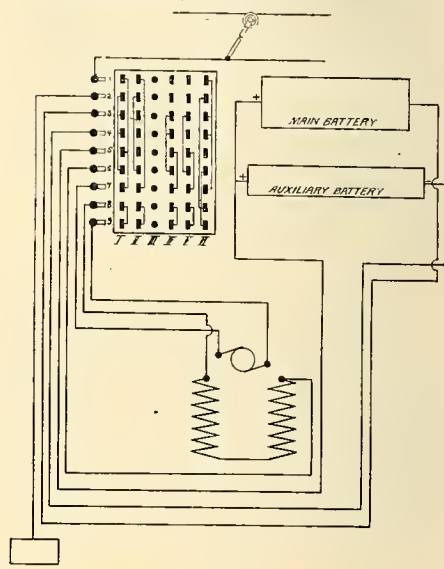
A system of electric distribution consisting of a primary circuit, a secondary circuit, two or more transformers common to both circuits, a device in the primary circuit, mechanically responding to current changes therein, an electromagnetic switching device automatically controlled by the responsive device, adapted to switch the transformers in and out of the primary and secondary circuits.

617,170. Combined Lightning Arrester and Fusible Cut-out. Burton L. Lawton and Ernest C. Wilcox, Meriden, Conn. Application filed August 2, 1898.

The device comprises a block or base of insulating material, a grounding terminal and pairs of line and instrument terminals mounted thereon, fusible cut-outs, each connecting a line and an instrument terminal, a copper plate mounted on the block, pairs of laminated carbon plates, one for each line terminal arranged on the copper plate, perforated mica strips spacing the carbon plates, an elastic copper strip connecting each line terminal with its corresponding pair of carbon plates and bearing upon and securing the latter in position, and a metallic binding post mounted upon the copper plate between the pairs of carbon plates, and an electrical contact with the copper plate, the binding post constituting the grounding terminal.

617,187. Means for Generating Electricity from Machinery of Locomotives. Harry F. Roach, St. Louis, Mo. Application filed October 10, 1898.

The dynamo is mounted upon the frame of a locomotive; cranks or eccentrics are mounted on the armature shaft of the dynamo, the cranks or eccentrics being arranged on the armature shaft at an angle with relation to each other, the armature is connected to the cross head of the locomotive and the cranks or eccentrics; for converting the reciprocating motion of the cross-head into rotary motion of the armature shaft.



NO. 617,192.

617,192. Electric Propulsion of Vehicles. Friedrich W. Schneider, Triberg, Germany. Application filed December 10, 1897.

The main battery, when starting, is put in circuit parallel with a small auxiliary battery constructed for quick discharge, for the purpose of supplying the additional current required at the start, essentially from the auxiliary battery, and thus avoiding a high rate of discharge from the main battery and augmenting its efficiency.

617,193. Electric Switch. Oscar H. Schuck, Philadelphia, Pa. Application filed July 2, 1898.

An alarm comprising an electric circuit, a swinging switch arm in the circuit, a contact brush in the circuit and with which the arm normally engages, a sliding plate adapted to hold the switch arm in its open position, and arranged to be moved to release the arm by the closing of a door, and a switch in the circuit normally held open by the closed door.

617,275. Quick-break Electric Switch. William F. Bossert and George L. Holton, Utica, N. Y. Application filed June 9, 1898.

In an electric switch there is the combination with electric contacts forming terminals of the circuit in which the switch is placed of a pair of independent switch blades pivoted at one end to one of the contacts, a coupling having grooves in its inner face to receive the other or free ends of the pair of switch blades, means connecting the blades and coupling, and actuating means for operating the switch.

617,287. Circuit-closer. Judson D. Garlock, Palmyra, N. Y. Application filed April 22, 1898.

The device comprises an indicator case having an angular seat, a firing face ring mounted upon the seat to be turned in either direction, a face plate secured to the ring parallel with the glass face of the indicator, a stud held rigidly in the face plate and terminating within the case in a curved end, a wire connected with the outer end of the stud, and a second stud carried by the face plate and adjustable to and from the other stud with its inner end within the case curved toward the curved end of the other stud, and a wire connected to the outer end of the stud, and a pointer adapted to vibrate between the curved ends of the studs.

REISSUE.

11,706. Electric Buoy. Ernst W. G. C. Hoffmann, Charlottenburg, Germany. Application filed December 8, 1898. Original number, 607,745, dated July 19, 1898.

This device is adapted to be floated and submerged, and contains a pump designed to secure the entrance and exit of the water serving as variable ballast in the device, the pump having a relatively large clearance, whereby the rarefaction of air in the device is avoided, means for actuating the pump controllably from without the device.

Western Electrician

EVERY SATURDAY.

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CHICAGO, JANUARY 21, 1899.

No. 3

Mechanical and Electrical Equipment of the Union Hotel.

Among the attractions of the newly fitted Union hotel and restaurant on Randolph street, Chicago, the very complete plant for lighting, heat, power, communication and ventilation is not the least interesting. The building is an old one remodeled, but the interior arrangement and fittings are entirely new. Advantage was taken of the opportunity by Mr. Herman Weber, the proprietor, to install a power plant having the latest improvements for efficiency, convenience and economy. But the exigencies of space and location—the filling of old bot-

tion (Fig. 2, p. 36), which were built to fit into the place assigned them.

There are two externally fired tubular-type boilers, each having 90 tubes $3\frac{1}{2}$ inches in diameter. The tube-heads are 12 feet apart and there is an 18-inch smokebox extension at the rear. In the front the boiler sheets are carried 36 inches beyond the tube-head for a combustion-chamber extension. A Hawley down-draft furnace especially constructed for the plant is attached to the combustion chamber. It is equipped with water grates and a water arch above the firebox. The circulating pipe is connected to the tube-head above the tubes on the line of the vertical diameter of the boiler. The outside

used. In case the exhaust steam should be insufficient to maintain this pressure in severe weather, a reducing-valve, installed for the purpose, comes into play, utilizing live steam for heating. In connection with the exhaust-steam piping there is a sensitive back-pressure valve which will open to the atmosphere and permit free exhaust to the outside air should the pressure rise above $5\frac{1}{2}$ pounds in the exhaust header.

A steel stack extending 220 feet above the grate bars gives ample draft to the furnaces. It is connected directly to the rear of the boilers. The hot gases from the combustion chamber pass directly through the tubes to the rear smokebox extension

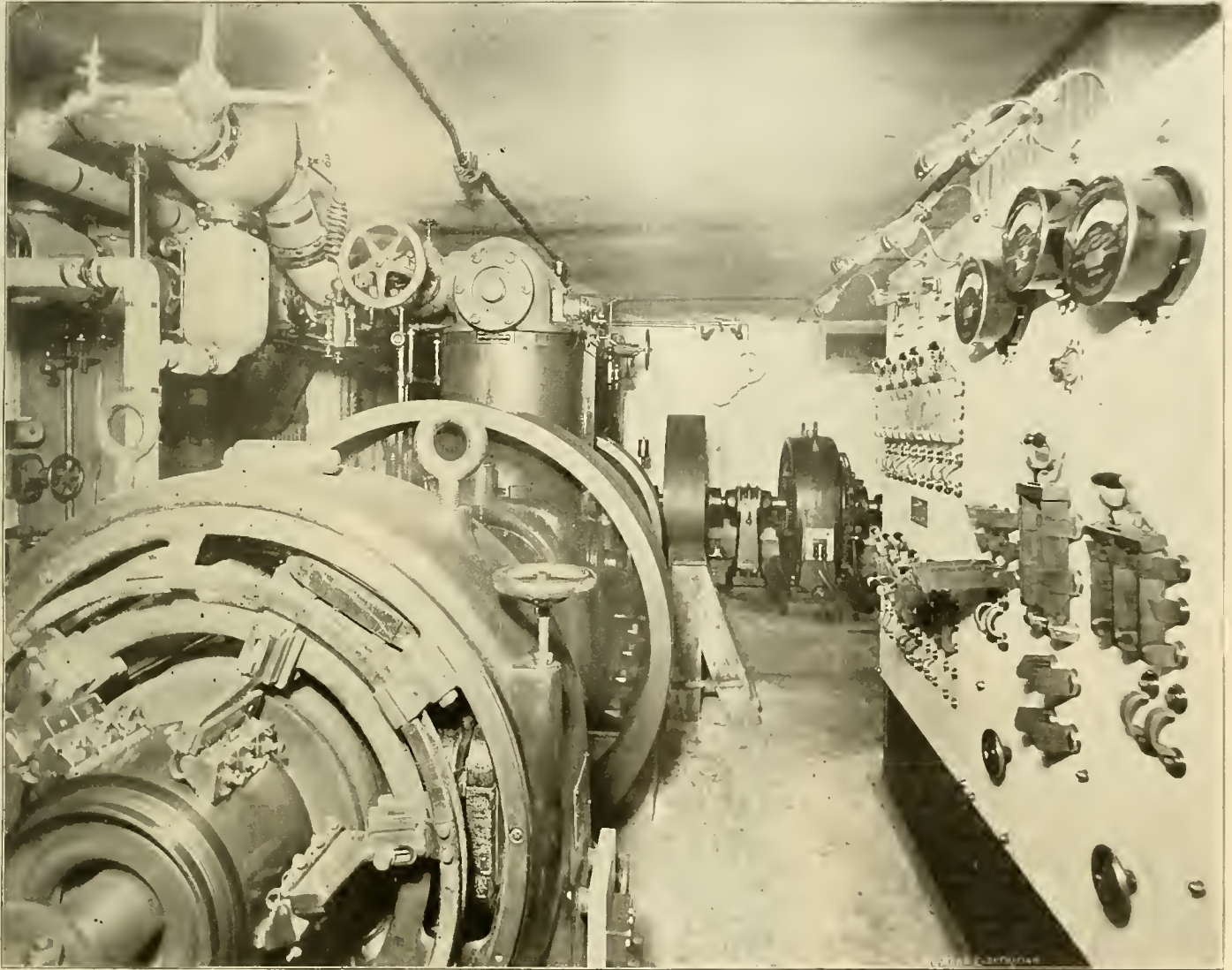


FIG. 1. MECHANICAL AND ELECTRICAL EQUIPMENT OF THE UNION HOTEL.—ENGINES, DYNAMOS AND SWITCHBOARD.

ties with new wine—made necessary some special features of interest.

The design of the steam and electrical generating plant was entrusted to Pierce & Richardson. A careful survey of the basement showed that the most available space for the steam-raising units had a width of 12 feet six inches with but seven feet eight inches of clear head-room. The position of the supporting columns of the building was the cause of the narrowness of the space, while it was impossible to excavate more than 10 inches before encountering the steel foundations extending out from the adjoining 18-story Ashland block. This depth of 10 inches was, in fact, utilized for the saddles supporting the new boilers and for the blow-off connections. Into the space available it was necessary to place boilers having a combined capacity of 200 horse power. The problem was essayed by Mr. S. G. Neiler, of the engineering firm mentioned, who designed the boilers now in opera-

diameter of the boiler is 72 inches and its total length is 16 feet six inches, the furnace extending six inches farther in front. So little head-room was left on top that the safety valves had to be placed on their sides.

These boilers are designed to evaporate 4,000 pounds of water each an hour from and at 212 degrees, the steam pressure to be carried at 120 pounds. They supply steam for two engines driving dynamos and also all the steam used for laundry purposes and for the heating tables, etc., in the kitchen, through a valve reducing the pressure to 30 pounds. To place them in position in the basement it was necessary to take up the flagstones of the sidewalk above and remove the curb and a portion of the retaining wall. Then an excavation was made in the street and the boilers were slid in place on skids.

For the general heating system of the building exhaust steam at about five pounds' pressure is

and thence through a short length of curved breeching to the stack.

Feed water is obtained partly from an artesian well on the premises, partly from the city mains. The boiler pump is of the Knowles type, and there are two Sellers re-starting injectors. Coal screenings are burned in the furnaces. The plant is operated 24 hours a day and now consumes five tons of screenings daily, carrying therewith an average load throughout the entire time of 400 amperes at 110 volts. The boiler guaranty is that $9\frac{1}{2}$ pounds of water shall be evaporated with one pound of Indiana coal. Tests are now making to determine whether this guaranty has been fulfilled. The boilers and furnaces were furnished by the Hawley Down-draft Furnace company of Chicago; the boilers were built by the Oil City (Pa.) Boiler Works.

One feature of this plant is the thorough and complete manner in which all details of economical operation are carried out—exceptional in so small a

plant. The piping system is complete and carefully laid out. The space is limited and the array of steam and water pipes seems complicated, but access is provided to every valve and every fitting. The high-pressure pipes are encased in the H. W. Johns felt covering and the others in asbestos sponge moulding. The row of overhead pipes shown in the picture of the boiler room (Fig. 2) is composed of hot-water return pipes leading to a header on the wall at the left, not shown in the photograph.

An interesting piece of apparatus designed to ef-

fect greater economy is a special Cochrane feed-water heater, expansion and return tank. This is placed in the engine room, but, being back of the engines, is not clearly shown in Fig. 1. It is of about 200 horse power capacity, being designed to raise 8,000 pounds of water from 60° to at least 204° in an hour. The filtering material is quartz sand together with the usual broken coke. In connection with the heater there is a special arrangement for purifying the feed water. Above the heater and connected with it is a tank holding a soda-ash solution which is fed into the heater through a sight-feed. This chemical precipitates all the sulphates in the water, while the temperature of the water in the heater—228°—due to the back pressure of five pounds, precipitates the carbonates. This, being done in the heater, prevents any scale-forming material from entering the boilers. The purity of the water is still further insured by a suitable connection in the pump discharge, whereby samples of the water going to the boilers can be drawn from time to time and tested. By this means the amount of soda ash to be admitted through the sight-feed is regulated very closely.

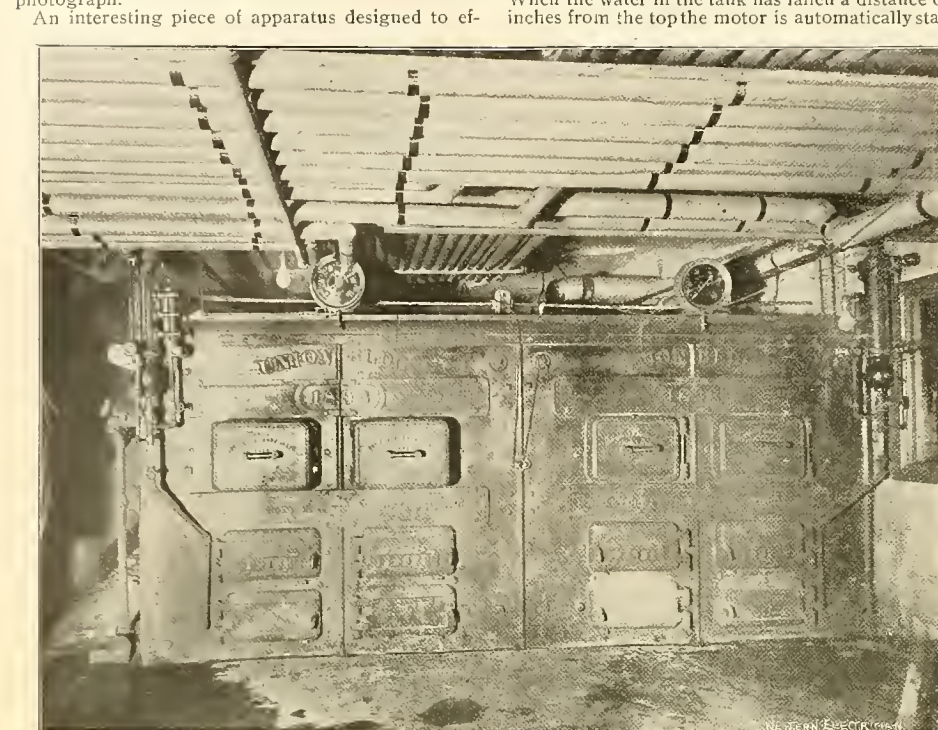


FIG. 2. MECHANICAL AND ELECTRICAL EQUIPMENT OF THE UNION HOTEL.—SPECIAL TUBULAR-TYPE BOILERS.

fect greater economy is a special Cochrane feed-water heater, expansion and return tank. This is placed in the engine room, but, being back of the engines, is not clearly shown in Fig. 1. It is of about 200 horse power capacity, being designed to raise 8,000 pounds of water from 60° to at least 204° in an hour. The filtering material is quartz sand together with the usual broken coke. In connection with the heater there is a special arrangement for purifying the feed water. Above the heater and connected with it is a tank holding a soda-ash solution which is fed into the heater through a sight-feed. This chemical precipitates all the sulphates in the water, while the temperature of the water in the heater—228°—due to the back pressure of five pounds, precipitates the carbonates. This, being done in the heater, prevents any scale-forming material from entering the boilers. The purity of the water is still further insured by a suitable connection in the pump discharge, whereby samples of the water going to the boilers can be drawn from time to time and tested. By this means the amount of soda ash to be admitted through the sight-feed is regulated very closely.

The plant is equipped with steam and oil separators. Each of the two engines has an individual steam separator. There is an oil separator in the main exhaust pipe in addition to one attached to the feed-water heater, thus preventing the admission of oil to the general heating system. All steam condensation from the appliances in the kitchen and laundry is brought back to a trap and returned to the heater. Drips from the steam separators are also carried to a trap, which discharges into the heater. Thus all condensation is saved.

With the exception of the deep-well pump all the machinery in the building is electrically driven. Current is supplied for light and power by the two engine-dynamo units shown in Fig. 1. The engines are of the Westinghouse compound, non-condensing, upright, inclosed type, and under test have shown a water consumption of not over 25 pounds per indicated horse power. They have a capacity of about 100 horse power each at 120 pounds steam pressure. The engines are directly coupled to Westinghouse 50-kilowatt, 110-volt, multipolar dynamos. The generating units are arranged in the shape of an L to utilize the limited space to the best advantage. The switchboard is a handsome one of white marble with Weston instruments and quick-break switches. It was installed by Rohn & Meyer of Milwaukee, who did the construction work.

Seven electric motors are operated on the 110-volt house circuits in various parts of the building. All were made by the Crocker-Wheeler company. Three of them are in the southern end of the engine room. One, the large motor shown in Fig. 3, drives a carbonic-acid ice machine by belting and a countershaft. It is a 25 horse power machine. Above this motor, in the picture, is seen a board with two ordinary motor-starting and controlling

and pumps water into the tank until automatically cut off when the water reaches the maximum height. Arrangements are also made so that the motor may be operated independent of the automatic device by a double-throw switch on the motor board. The motor shown at the right in Fig. 3 is of three horse power and is belted to a brine pump used in the refrigerating system. In the center of this picture, mounted on a masonry foundation, is the Knowles steam deep-well pump. This pump lifts the water from the artesian well, which is 446 feet deep, the water level being 110 feet below the basement.

In the kitchen a five horse power motor is in-



FIG. 3. MECHANICAL AND ELECTRICAL EQUIPMENT OF THE UNION HOTEL.—MOTORS IN THE ENGINE ROOM.

stalled to drive a dish-washing machine and the dumb-waiters through the medium of belting and a short line shaft. A picture of one end of the kitchen, showing this equipment, is given in Fig. 4. Another five horse power motor drives the laundry machinery. On the upper floors there are two motors. One, a 25 horse power machine, in the second story, drives a large exhaust fan which operates the ventilating system of the whole building, pipes for changing the air radiating to all parts of the building. The other motor operates the passenger elevator running from the hotel entrance to the top of the building. It is of 15 horse power and is located at the top of the elevator shaft.

About 800 incandescent lamps are connected to

the wiring system—600 of 16 candle power each and 200 of 25 candle power. The larger lamps are used principally in the electroliers in the restaurants on the first and second floors. These fixtures are elaborate and handsome. Lamp signals are used to summon the waiters in the restaurants. Each waiter has a number, and a lamp back of the corresponding number on a glass sign is lighted from a little switchboard in the serving room when the waiter is wanted to deliver an order received from the kitchen by the dumb-waiter. When the waiter enters the serving room he opens the switch bearing his number and cuts out his lamp. A similar system is used in the private dining rooms, and the noise of bells is avoided.

Every guest room in the hotel has a telephone communicating with the office. There are also telephones in each hall and reception room, in the restaurant office, hotel office and private office, engine room, steward's room, kitchen and laundry. In all about 45 instruments, made by Rohn & Meyer, are installed. The system is not an intercommunicating one, but by repeating messages in the offices any part of the building may be communicated with from any other part.

Other electrical features include a recording watchman's clock, a complete hotel annunciator system and an emergency fire-alarm device by which all the bells in the house may be rung at once. The telephone and call-bell circuits are operated by 12 cells of storage battery in the engine room, arranged so that six cells are supplying working current while the others are being charged. Sixteen candle power lamps are in series in the charging circuit to reduce the voltage. Automatic alarm bells are connected with the system so that they will ring and call the attention of the engineer should a fuse be blown.

Polyphase Transmission of Power¹

By F. WALLIS.

The transmission of energy by polyphase currents has made much greater progress abroad than it has in this country, and, in addition to our national conservatism in adopting new methods, there are two main reasons for our backwardness. In the first place, there are but few sources of water power in Great Britain, and, recently, steam power can be obtained comparatively cheap all over the country. In Switzerland and in America, where long-distance transmission has made such strides, water power in large quantities is constantly to be met with, and is naturally taken advantage of, while, again, in the mining districts of both America and South Africa, fuel can often only be obtained at very great cost, and consequently it is cheaper to transmit power over a great distance from one large center, where water power or fuel can be more easily obtained, than to have a number of isolated plants.

Nevertheless, there is a considerable field even in this country for the transmission of power in large quantities over long distances—say, 20 to 40, or even 50, miles, for not only might great generat-

ing stations be erected near the coal pits, where fuel can be obtained delivered to the boilers at 25. 6d. per ton, but, further, the enormous power that runs to waste in our blast furnaces might be in part utilized for the generation of electricity. It has been estimated that, for every 100 tons of metal cast, energy sufficient to generate 2,000 horse power for one week is wasted in blast-furnace gas, and that throughout the country about 2,000,000 horse power is thus wasted.

But quite apart from such problematical schemes there are many cases in which polyphase transmission might be advantageously employed. For instance, at Dublin, where the generating station

¹ From the London Electrician.

is only seven miles from the furthest sub-station and the pressure employed is only 3,000 volts, polyphase transmission has been found to give admirable results. Indeed, wherever it is desirable to work at a pressure of 2,000 or 3,000 volts or more, polyphase transmission offers many advantages. Again, in many cases where the generating station is within a few hundred yards of the area of supply, the polyphase system may be profitably adopted, owing to its suitability for motor work. This particularly applies to the case of the transmission of power in works where motors form the chief part of the load. And it must be borne in mind that even though there may not be many openings for long-distance transmission at voltages of 10,000 or so in England, many such transmissions are required in the colonies and elsewhere abroad, and it is preferable that the necessary plant should be installed by English engineers.

The question thus arises, What is the greatest distance to which electrical energy can be economically transmitted, and how do the various systems of transmission compare with one another? The largest circuit yet employed has been the experimental one between Frankfort and Lauffen, a distance of 100 miles, over which 300 horse power has been transmitted at 3,000 volts, three-phase currents being employed; 4,000 horse power has also been transmitted on the three-phase system at 10,000 volts over 24 miles at Sacramento, and 1,400 horse power at 11,000 volts over 35 miles at Fresno, Cal., not to mention the Niagara-Buffalo line and many others. There are also several two-phase lines at work. Of single-phase alternating lines, that at Rome may be mentioned, where 2,000 horse power is transmitted at 6,000 volts from the Falls of Tivoli, 18 miles distant from the city. M. Thury and others have also installed several long-distance continuous-current plants, of which that at Geneva, where 400 horse power at 6,600 volts is transmitted over 20 miles, is the longest, though the Brescia line, over which 700 horse power is transmitted 12 miles, is worked at the highest voltage, namely, 15,000. In the case of many of these transmissions, where water power is employed, it must be remembered that the power available is greatly in excess of that required, and that consequently very considerable losses in the line and plant could be permitted.

Abroad, transmission of power is almost invariably carried out by bare overhead wires. In England no such transmission on any large scale has yet been tried, and it is more than probable that the Board of Trade would insist on insulated cables being laid either underground or by the side of a railway, or in some such thoroughly safe and efficient manner, whenever a high voltage was employed. And in many ways this would be an advantage, for any long-distance transmission would necessarily be on a very large scale, and any breakdown, which might easily occur with overhead wires, would cause great loss to the community. Further, overhead wires have great inductive effects, and in a crowded country like England would cause much trouble. The underground mains would, of course, be either concentric or laid very close together.

In other countries the conditions are, as a rule, entirely different. The chief consideration is generally small first cost, and, consequently, bare overhead conductors are almost universally employed. But, even with these, there are limits to the voltage which may be employed; not, indeed, in the apparatus at the ends of the line, for transformers can be made to safely stand almost any voltage, but in the line itself. In a very dry climate 20,000 or 30,000 volts may be safely employed, but in a damp and foggy atmosphere, even 10,000 volts may be too high for satisfactory working, owing to moisture collecting on the insulators, and so causing short-circuits.

But, granted a long-distance transmission, the question still remains, How does the polyphase system compare with the direct-current and with the single-phase alternating? Now, though direct currents have been employed by M. Thury over considerable distances at very high pressure (e. g., the 15,000 volts at Brescia), there are many disadvantages connected with such a system. In the first place, as M. Thury himself states, the maximum output of a high-pressure continuous-current dynamo is about 45 amperes at 3,000, or, at most, 4,000 volts; hence, for generation at 15,000 volts, four or five machines must be coupled in series; and likewise, wherever it is desired to tap the mains, another four or five machines in series must be run as motors, each either helping to drive a common shaft, from which a large generator may be driven to supply the lower potential current required for distribution, or driving its own smaller generator direct. In other words, large units with the corresponding gain in efficiency and in first cost cannot be employed with the continuous-current system. And, further, since commutators must be employed at the full potential of line, the risk of accident to the attendants or to the machines themselves is very great. On the other hand, the employment of the direct current admits of a saving in the weight of copper in the line as compared with any of the alternating systems, the relative figures for direct-current, single-phase, two-phase, four-wire and three-phase circuits being 0.50, 1.00, 1.00, 0.75, assuming the same maximum potential

difference in each case. As a matter of fact, the gain in copper is even greater, for in almost all alternating circuits the power factor is less than unity, and consequently a greater current has to be carried than corresponds to the power transmitted. On the other hand, in the above figures it is assumed that the maximum alternating electromotive force is $\sqrt{2}$ times the effective electromotive force, and though this is approximately true, it should be remembered that the disruptive discharge due to an alternating electromotive force is sluggish; that is to say, does not at once follow the applied electromotive force, so that, to take an instance, an alternating electromotive force of more than $\frac{15,000}{\sqrt{2}}$ effective volts is

required to produce the same disruptive effect as a continuous-current electromotive force of 15,000 volts. Further, there is no electrolytic effect with an alternating current, nor does the osmotic effect, whereby moisture creeps to the negative pole of a continuous-current circuit, exist. Of course, with underground cables these effects would not, under normal circumstances, be present; yet should by any chance a minute leak develop they would at once manifest themselves.

On the whole, in the majority of cases, it will be found that though there would be a considerable saving of copper in the line, the continuous-current system is placed out of court by the fact that the generators and motors have to be split up into, comparatively speaking, small units, and that a considerable element of danger is always present owing

end of a line to the other in large quantities, for in such a case the cost of the exciter and of the battery of accumulators or the small non-synchronous motor required for starting purposes does not bear a large proportion to the total cost of the installation, nor is the extra attendance required for these a serious item. But where only small motors are concerned such complication becomes prohibitive, and though many induction and other self-starting motors have been brought forward, none have yet proved themselves sufficiently satisfactory for general adoption, or at least, as a matter of fact, have not yet been generally adopted. It should be added that synchronous motors may be started, not only by small subsidiary self-starting motors, or by driving their exciters as motors from a battery of accumulators, but also by supplying the exciters from the alternating-current mains when, provided their field-magnets are laminated, they will run as alternate-current motors. But this method involves the use of the laminated fields and other complications, and does not seem to be often employed.

With the polyphase system the difficulty of self-starting is entirely done away with. Even synchronous polyphase motors will start themselves, owing to the reaction of the eddy currents induced in the solid pole-pieces, provided the pole-pieces are solid, and not laminated at the tips, as is often the case; but as the resulting torque is not very great, the motors have to be started light and the load only thrown on when they are running in synchronism. Synchronous motors have the great advantage of a power factor of nearly unity when



FIG. 4 MECHANICAL AND ELECTRICAL EQUIPMENT OF THE UNION HOTEL.—MOTOR-DRIVEN DISH-WASHING MACHINE AND DUMB-WAITERS.

to the necessarily more or less exposed commutators being at high potentials above the earth.

The single-phase alternating system is well adapted for the transmission of power over long distances when it is simply a case of one receiving station where the one or two large motors convert all the energy at once into its mechanical equivalent. In the text-books it is shown that the system requires more copper in the line than the three-phase, the proportion being 100 to 75; but, as large single-phase motors, such as have just been referred to, are always synchronous, and there is practically no lagging current in the line, whereas with a three-phase transmission the power factor will rarely exceed 80 per cent., and the line wires have to be increased proportionately in size, it follows that there will not in practice be much difference in the weights of copper employed. The real objections to the single-phase system are two in number—first, that the motors employed have to be of the synchronous type, and, secondly, that rotary converters designed to transform single-phase alternating currents into continuous current cannot be built for an output much above, say, 50 kilowatts, on account of the excessive sparking at the commutator, this sparking being due to the great fluctuations in the alternating current in the armature. A synchronous motor might, of course, be arranged to drive an entirely separate continuous-current dynamo and the sparking difficulty so got rid of, but the cost of the two machines would considerably exceed that of a polyphase rotary converter, and the efficiency of the conversion would be lower. But the chief objection to the single-phase system is undoubtedly that first mentioned, namely, that synchronous motors have to be employed which cannot be started without external aid, and further require separate field excitation. This does not matter so much in a large transmission, where power is simply sent from one

properly excited, and hence, if three-phase synchronous motors are employed, there is a saving of 25 per cent. of the line copper over the single-phase system. But in spite of their lower power factor, induction motors are far more generally employed on polyphase circuits. With these there is no difficulty in starting, even under full load. Small motors up to 10 horse power or so are generally made with squirrel-cage rotors, and these when starting under full load take for a short time a current of two or three times the normal full-load value. Larger machines are provided with a variable resistance in the rotor circuit, and will start under full load, taking only the normal current. For cranes and hoists the rotors are wound to have a considerable resistance, and a starting torque of even five times the normal can be obtained.

Further, the polyphase system has the advantage of being peculiarly well adapted for use with rotary converters. A three-phase current can thus be transformed into a single-phase, a two-phase or a continuous current, though for conversion into single-phase or two-phase it is far simpler and more efficient to use static transformers. For conversion into continuous current, however, rotary transformers must be used, and since in polyphase systems the flow of power is constant there is no difficulty with sparking at the commutator. Indeed, the tendency to spark and the demagnetizing effect of the armature is far less than with continuous-current dynamos, since the armature reactions of the two circuits tend to neutralize one another. Thus we are told that the 600-kilowatt converters at Niagara will give 900 kilowatts without sparking.

It is rather a drawback to the use of the rotary converter that as a rule it requires a static transformer to reduce the polyphase voltage before it reaches the machine. The reason is that continuous currents are almost always required at low voltage,

and a rotary converter with only one armature winding has a fixed ratio between its polyphase and continuous-current voltages, the former being lower than the latter. But even were any voltage ratio possible it would still be undesirable to introduce high-potential currents into a revolving armature, and static transformers would have to be employed. From what has been said it must not be inferred that static transformers must necessarily be employed with motors, for such is not the case. The polyphase circuits can be, and in large sizes generally are, led into the stationary portion of the motor, where they can be as well and safely insulated as in a transformer itself. Small motors, however, cannot be wound for high pressure except at prohibitive cost, the limit for a 20 horse power

in the other two branches on the motors will rise to make good the deficit, and the voltages will once again become approximately equal. Nevertheless, many engineers prefer the two-phase system with four wires, where, as the two circuits are electrically independent of each other, they can be independently regulated. The lamps are then each on their own circuit, and only in the motors are the two phases brought into play. For this reason it has been suggested that it would be better to employ three-phase transmission in the line on account of the saving of copper (the weight for the same maximum potential difference as compared with the two-phase four-wire system being in the proportion of 75 to 100), and at the receiving points to transform by static transformers to the two-phase system.

A third method is to transform from three-phase to continuous currents by the use of rotary converters, and much can be said in its favor. In the first place rotary converters can be made to act not only as transformers, but also as boosters, for the field winding may be compound, and sufficient series turns employed to actually make the full-load voltage greater than at no load, the phase relations in the polyphase circuit being altered thereby. Again the periodicity of the polyphase circuits may be too low for the satisfactory working of lamps (neither arc nor incandescent lamps should be worked under 40 revolutions per second), and then the only thing to do is to distribute by continuous currents. Further, the regulation of a continuous-current voltage is easy, and of course, continuous-current motors work satisfactorily. Such a combined system is particularly well adapted for traction purposes, where, on account of induction troubles and of three-phase currents requiring at least two trolley wires, it is, as a rule, impossible to use anything but continuous currents for the working of the cars. On the other hand, the use of the polyphase system throughout is in many cases more satisfactory. Where motors alone are to be driven the conversion to continuous current is quite unnecessary, for, as has been said, large motors can be supplied directly from the high-pressure mains, and smaller ones only require static transformers in place of the more costly and less efficient rotary converters. Where, however, the distribution is mixed, that is to say, where motors and lights have to be run from the same circuits, the question is not so easy of solution even when the frequency is high enough for lighting purposes. Although in some cases, as has been mentioned, the regulation of voltage on polyphase circuits has been found to be a comparatively simple matter, the experience obtained has perhaps not yet been sufficient for us to say that this will always be the case, and it may be taken as a maxim that wherever regulation will be a difficult matter requiring great care and attention it will be more economical in the end to install some simpler system, even at an increased first cost. Again, though accumulators may be charged by means of rectifiers or rotary transformers from alternating circuits, their use is almost entirely confined to continuous-current distribution.

So far as the motors are concerned the polyphase system more than holds its own. Not only will induction motors start under full load, but their regulation is an easy matter. Synchronous motors will run at absolutely constant speed, no matter what the load, and well-designed induction motors of from two horse power to 100 horse power drop only from eight per cent. to four per cent. in speed at full load. They thus act like continuous-current shunt motors. Their efficiencies between these sizes vary from about 76 per cent. to 92 per cent., and could be designed to be greater still. As a rule, the regulation of speed is effected by a variable ohmic resistance in the rotor circuit, though in cases where large starting torque is not required auto-transformers, which inductively reduce the voltage of supply, are often employed. Alteration in speed may also be effected by alteration of the number of stator poles, by changing the connections from star to mesh, and by coupling two motors together, so that the rotor current of the first machine supplies the stator of the second. As a rule, however, regulation is effected by altering the resistance of the rotor circuit, though this method has the disadvantage that when carried out to any large extent the efficiency is considerably reduced. The polyphase motor has, further, the great advantage over the continuous-current motor of requiring no commutator. It is also of very strong mechanical construction, and requires little or no attention. Likewise, for equal power, its weight is less than that of the direct-current machine, while, at the same time, it can stand very considerable overloading for a short time. There is very little difference in efficiency, power factor, starting torque and exciting current between the three-phase and the two-phase motor, what slight difference there is being in favor of the three-phase.

A great deal has been said concerning the low-power factor of polyphase systems. For transmissions in which the load consists chiefly of induction motors, the factor varies from about 0.65 to 0.85. As a rule it will be about 0.75 or 0.8. The motors and transformers, and not the line, are the chief sources of the lag of current behind the electromotive force, though the result of a low-power factor is increased size of plant all round. The coil can, however, be compensated for to a considerable

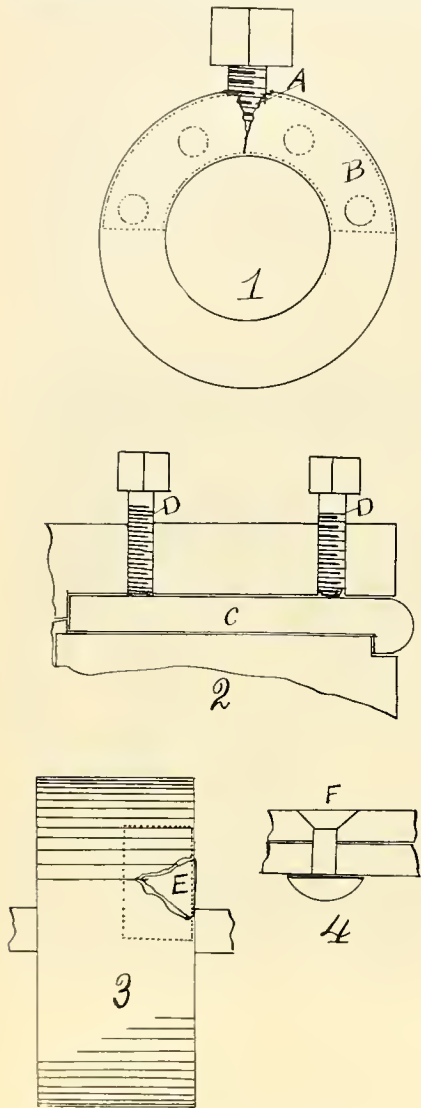
extent by the employment of a few large synchronous motors, which not only have no lag when properly excited, but when over-excited will still run as motors, with the current leading the electromotive force. They then, in fact, act as condensers. One American firm actually sends out condensers with its motors, but, generally speaking, the condenser cannot yet be regarded as a commercial article. In the matter of power factor the advantage of the three-phase over the two-phase motor is so small as to be practically negligible. It must be remembered that as the load decreases the power factor also decreases, so that when the motor is running light, and absorbing but little energy, the current it takes is still 20 to 30 per cent. of the full-load current.

With the introduction of polyphase motors frequencies have fallen considerably from those of 100 cycles per second and more employed some years ago for electric lighting. The higher the frequency the cheaper are the transformers, but, on the other hand, if a motor is to run on a high-frequency circuit at a given speed, it must have an increased number of poles, and this, in small sizes, at least, means increased size and cost. Further, the higher the frequency the greater the magnetic leakage and the magnetizing current required. Also, the higher the frequency the greater is the skin effect in conductors, and consequently the more finely must they be subdivided. At Niagara a periodicity of 25 has been adopted, and this is but little lower than that of the majority of polyphase transmissions in America. In Europe a rather higher figure, of somewhere over 40, is more general, in order that the circuits may be employed for lighting as well as for motive purposes.

Repairing Electrical Machinery.

By B. F. FELS.

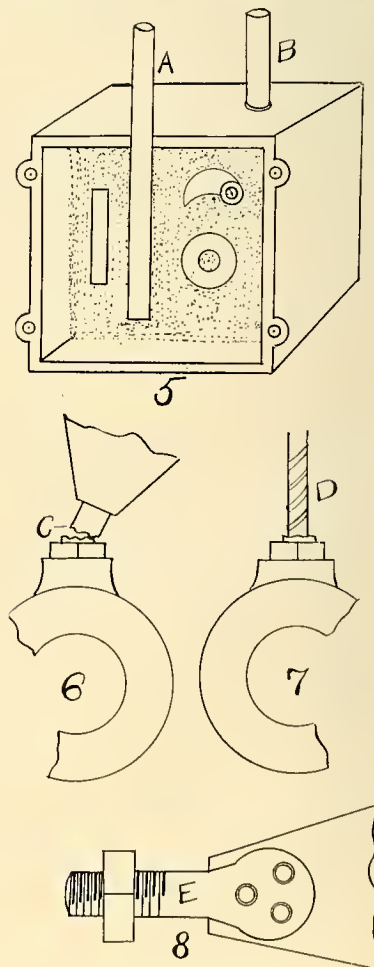
A collar on a shaft of an adjusting spindle is frequently broken, as in the case illustrated in Fig. 1, at *A*, owing to the expansion of the collar when un-



REPAIRING ELECTRICAL MACHINERY

motor being about 1,000 volts, and with these static transformers must be employed.

Thus in a large transmission system large motors will take current direct from the high-pressure mains, while for smaller motors one or more distributing centers with large static transformers will be established. Lamps may also be run from the low-pressure polyphase circuits, being connected either between the three mains in a three-phase system, or, preferably, between each of the mains and a fourth balance wire running to the junction of the three circuits on the low-pressure side of the static transformer, in which case the latter must be star wound. In a balanced three-phase system the sum of the three currents is always zero, and so a fourth return wire is unnecessary, but where the load may be unevenly distributed, as is the case when lights are run from the mains, a fourth wire will take the unbalanced current and the voltage regulation is more satisfactory than if no return wire were used. As against the extra weight of the return wire this system has the advantage that the voltage between the mains is raised to $\sqrt{3}$ times that required by the lamps, and consequently the mains conductors take less copper. On the other hand, in many cases in practice there is no difficulty in obtaining a good balance even without the supply of a fourth wire. The motors on the circuits act as automatic regulators, for should the voltage between any pair of mains fall, owing to extra lamps being switched on to that circuit, the current in the corresponding branch of the motor windings will fall. The back electromotive force in these branches will rise and the current will further fall, while at the same time the currents



REPAIRING ELECTRICAL MACHINERY.

der strain, or when the set-screw is forced too tightly into the seat. When a fracture of this description occurs, it is not necessary to discard the collar, as it may be repaired by riveting on a piece of thin soft steel, as represented by the dotted portions. These pieces should be provided for each side of the collar, and, if an extra good job is wanted, the pieces may be sunk into the sides by filing off some of the metal. After shaping the pieces to conform to the collar, drill four rivet holes in each, and mark the places for boring the collar to correspond. The rivet may then be inserted, countersunk, headed and filed off smooth, making a neat and substantial piece of work. If the patched parts are held against an emery wheel or

grinder for a short time, the resulting polish will cover up the joints and rivet heads.

TROUBLESOME KEY.

Electrical machinery, when operated at extra high speed, is sometimes productive of loose nuts, bolts, set keys, etc. In a recent case which came to notice, the high speed of a motor caused one of the driving pulleys to give trouble by loosening on the shaft. Pieces of tin, etc., were driven in with the key, but the latter persisted in working loose every few days, and had to be tightened over again. Fig. 2 is a section of the parts, showing the key C in its seat between the wheel hub and the shaft. This trouble was permanently overcome by boring two set-screw holes in the hub and inserting the set-screws D D into these, as shown. These set-screws were brought to bear firmly upon the key, thus taking up the surplus space. They served to retain the screw securely in its seat.

PATCHING A BROKEN PULLEY.

A piece was broken from the rim of a pulley attached to the driving shaft of a dynamo, and the sharp edges cut into the leather driving belt so badly that the floor was strewn with fine particles of leather ground from the belt. In time the belt would have been completely destroyed. This fracture was repaired, as shown in Fig. 3. The piece which had broken out was replaced and a sheet-iron patch riveted to the inner side of the rim, as represented by the dotted portions at E. The rivets were countersunk, as at F, Fig. 4, and the heads finished off by grinding and rubbing off with oil and emery, thus eliminating roughness of any sort. After this the belt was not cut in any way, and the pulley was practically as serviceable as a new one.

HARDENING.

The reason why hardened parts of electrical devices often fail to give satisfaction is that the process of hardening was not properly performed. In some shops the pieces are treated in bone-meal, but no provisions taken to test the operation in its different stages and govern the time of exposure accordingly. Fig. 5 is a suggestion for a cast-iron heating box, easily made and simply operated. The feature of the box is the tell-tale or testing arrangement. This consists of two or more sample pieces made from the same material as the pieces to be hardened. These are marked A and B in the drawing, and are introduced to the contents of the box through apertures cut in the top.

As the meal is laid in layers under and over the piece to be hardened, the sample pieces are pushed in, and when the box is filled, the lid secured and the whole affair in the furnace in process of heating, the tell-tales can be withdrawn at intervals and the hardness of the metal tested. After the proper temperature is obtained, the box is removed, the lid taken off, the pieces shaken from the carbonized bone and dipped into water, or oil, as the case may be.

REPAIRING A FAN BLADE.

If the blade of a fan breaks off, after the manner indicated at C, Fig. 6, it may be repaired by first turning a drill into the stub of the blade shaft which remains in the shoulder of the hub flange,

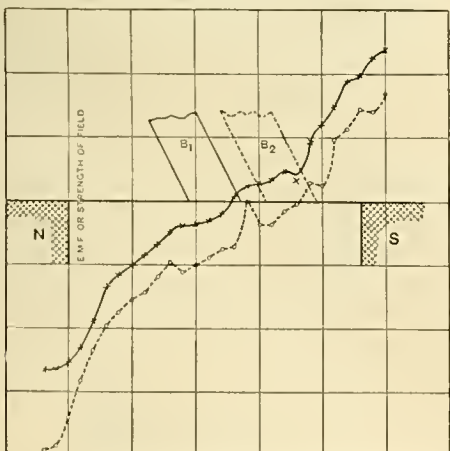


Fig. 5. Dynamo Curves with Thin Brush; Full Line Curve, 7 Amperes; Dotted Line Curve, 35 Amperes.

EFFECT OF COMMUTATION ON THE FIELD OF DYNAMOS AND MOTORS.

as presented in Fig. 7, in which D marks the drill. After a hole is sunk deep enough to receive a beveled, pointed steel tool, the remains of the stub can be turned from its thread. This leaves the hole free for a new end. Fig. 8 illustrates a method frequently used by the writer for substituting a new end for the foot of the blade. First, all of the old end is cut off close to the foot. Then a piece of steel rod is turned down with the proper size thread, a nut is put on one end, while the other end is split and the sides are flattened out to fit over the foot of the blade, as at E. Then two or three rivet holes are drilled through both sides and the blade, and when the rivets are put in and headed up, the repaired part is secure, and experience shows that it will last as long as the blade itself or any other part of the fan.

Effect of Commutation on the Field of Dynamos and Motors.

The London Electrician recently described a series of experiments upon this subject which were conducted by W. H. Everett and A. H. Peake, supplementing an investigation of the character of the change of current in an armature coil of a dynamo and motor respectively, while that coil is passing under either brush. The experiments were made with a two-pole, five-kilowatt Crompton machine. An exploring coil of 10 turns of fine wire was wound on one of the armature coils, one end being connected to a slip-ring and the other to a revolving adjustable contact-maker. In this way the electromotive force generated in the coil at any instant

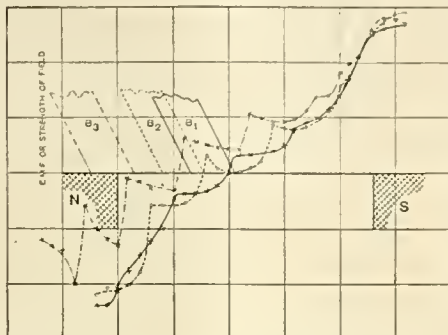


Fig. 1. Motor Curves with Thin Brush: Full Line Curve, 2 Amperes; Dotted Line Curve, 8 Amperes; Chain-dotted Line Curve, 27 Amperes.

EFFECT OF COMMUTATION ON THE FIELD OF DYNAMOS AND MOTORS.

could be found by charging a condenser with this electromotive force and then discharging it at will through a ballistic galvanometer. Each armature coil consisted of two layers of three turns each, and the exploring coil was wound between the middle and rear conductors of the upper layer.

In the accompanying illustrations, abscissæ show the relative positions of the center of the armature coil on which the exploring coil was wound, the pole-tips N, S and the brush B, the intercept between successive ordinates representing the width of one coil; and ordinates represent the electromotive force induced in the exploring coil. A change in the speed of the machine merely produced a proportionate change in the deflections of the galvanometer, so that for the sake of comparison the vertical scale is made inversely proportional to the speed in each case.

Three different brushes were successively used. The first was divided into two parts connected by a low resistance, and giving electromotive-force curves under the same conditions as for the current curves previously obtained. The second was an ordinary brush, but of the same thickness only as the first. The third was an ordinary brush of sufficient thickness to cover about one segment and a third.

Broadly speaking, the curves show that the elec-

tricity of the effect is clearly shown in the curves causing successive ripples, of which the one under the brush is, we should expect, the most marked. A decrease in the positive, or an increase in the negative current in a coil causes a positive induced electromotive force in that coil, and vice versa; therefore, comparing these ripples with the curve of current change shown in the former article, a descent in the current curve should correspond to a positive distortion or excessive rise in the electromotive force curve, and an ascent in the current curve to a depression in the electromotive force curve. In some of the curves it will be seen that there is an indication of this correspondence.

When the brush was not in the correct position to avoid sparking, sudden sharp deflections were

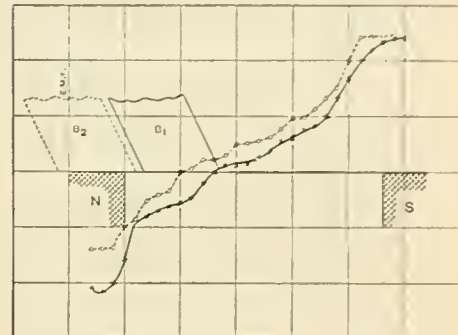


Fig. 2. Motor Curves with Ordinary Brush: Full Line Curve, 3 Amperes; Dotted Line Curve, 16 Amperes.

found to occur in the curves at points where the segments of the commutator leave the toe of the brush. These deflections are downward when the brush is too far backward, and upward when it is too far forward, as would be expected from the change (due to contact resistance) of the current in the coil leaving the brush.

When the thin brush is used (Figs. 1 and 3), the ripples, in both dynamo and motor curves, are much more pronounced with heavy than with light loads, since the current change is greater. Again, the difference between the dynamo curves, at various loads, is not nearly so great as between the motor curves; moreover, in the case of the dynamo the curves are smoother than in the case of the motor. These results are probably both due to the same cause, namely, that the current and electromotive force in the coils under the brush are changing in the same direction in a dynamo, but in opposite directions in a motor. In comparing curves for different loads it should be borne in mind that the brush does not remain in the same position, being always adjusted to avoid sparking; this accounts for the crossing and recrossing of some of the curves.

Experiment shows that there is no appreciable difference produced in the character of the curves by exchanging the split brush for an ordinary one of the same thickness; accordingly, none of the solid thin-brush curves have been included in the figures. With the thicker brush the curves are comparatively smooth in all cases; this, of course, is chiefly noticeable in the heavy load curves, since they were originally the most rippled. The reason for this smoothing effect is, presumably, that whenever one coil has just come under the brush, or is just leaving it, there is an adjacent coil also short-circuited, which acts like the closed secondary of a transformer, and thus partly counteracts the self-induction of the first coil. Hence, any sudden change of current in one of the shorted coils has a less effect on the main field, since its influence is counteracted by a corresponding change in the adjacent coil. The field, therefore, is steadier and the electromotive-force curve smoother with the thicker brush.

Government Controls Cable at Manila.

General Otis has informed the War Department that he has established a censorship over telegrams from and to Manila. This action was taken by General Otis on his own authority, but it has the hearty approval of the government. General A. W. Greely, chief of the signal service, who has charge of military telegraphs, said that in his opinion the censorship should have been established several weeks ago. The publication in the Manila papers of dispatches from the United States concerning the views of the administration on the attitude of the insurgents and the method in which they should be treated is regarded as the reason for the action of General Otis. It is probable that had not General Otis placed a censor in charge of the Manila telegraph office the War Department would have directed him to do so.

The North and West Chicago Street Railroad companies, which are known as Yerkes' properties, has made application to the City Council for permission to extend the overhead trolley system so as to cover all their lines. The corporations agree to increase the number of cars operated and grant other concessions if the city will grant the application.



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DEPARTMENTS.

Table listing departmental contents with page numbers. Includes: Correspondence, New Corporations, Electric Lighting, Electric Railways, Telegraph, Power Transmission, Publications, Electrical Securities, Miscellaneous, Trade News, Builings, Illustrated Electrical Patent Record.

New York still entertains hopes of securing rapid transit through the efforts of the commission appointed for the purpose of preparing a satisfactory plan for such service. The commission has been in existence since 1891, it has cost the taxpayers \$426,470.14, and thus far its efforts have proved futile. Mayor Van Wyck, in his annual message, says: "It is to be hoped that the present Board of Rapid Transit Commissioners will, during the current year, furnish a plan not only feasible as to construction, but also entirely relieved from many features which might provoke either determined opposition or cause any considerable delay." It seems to be about time for the commission to go out of business if it cannot accomplish anything. Whatever merit or defect may have been contained in the plans already submitted they have not received

public approval, and no matter what the cause may be, the commission ought not to be continued at public expense unless it can command public confidence and support. New York may be in need of rapid transit, but if the people do not approve the plans of the commission, some other means should be relied upon for relief.

The Austrian government is endeavoring to encourage industrial enterprises and develop inventive genius. Patent laws have been enacted providing for examination as to originality of invention and granting three years in which the invention may be worked, "unless the interests of the state demands its working before the expiration of that period."

Another innovation is the concession recently granted for the establishment of an inventors' bank. The institution will be aided by the government and will be under its special supervision. It is proposed to aid inventors, advance money for the development of patents and the establishment of enterprises found upon patented inventions, and engage in commercial enterprises of this character.

The question of establishing a Pacific cable is now fairly before Congress and early action may be anticipated, as the administration appreciates the urgency of the demand for facilities for telegraphic communication with Hawaii, the Philippines and Hongkong. Senator Lodge recently introduced a bill providing for subsidizing a private company to undertake the work, and another bill has since been introduced by Senator Butler authorizing the construction and operation by the government of a telegraphic cable from San Francisco to Honolulu, thence to Manila by way of Ualan and Guam, and thence to Hongkong. The bill carries an appropriation of \$8,000,000.

It has been assumed that the expense of establishing cable communication with Honolulu, Manila and Hongkong would be less than some earlier cable enterprises because of the improved methods employed in making the cable itself and the experience gained in this class of work. It is pointed out, however, that all estimates as to the actual cost are merely guess work. The question arises where will the gutta-percha be obtained for this great cable. The present price is exceedingly high and the tendency to raise it is so great that everything pointing to the determination of the American government to engage in the enterprise advances the market a notch or two. The visible supply of gutta-percha is reported as being inadequate to the demands for it, and the necessity for securing a reliable, efficient and economical substitute grows more pressing every day.

Objections have been raised by foreign manufacturers who propose to exhibit at the Paris Exposition of 1900 that the management is making everything subservient to French interests. Mr. James Dredge, speaking for the English exhibitors, protests vigorously against the plan of "transferring the overflow from the exposition to Vincennes, which is practically six miles away from the main show, and entailing a journey of an hour and a half to reach it." Mr. Dredge contends that "here will be buried in obscurity at least one section as important to America as to England. That is the transportation section, including locomotives, motors, motorcycles and bicycles." The London correspondent of the Chicago Record cables the following expression of opinion on this subject by Mr. Dredge:

So strongly do the English manufacturers feel on this point, now that they realize what it means, that they are considering withdrawing altogether. Among most of the large exhibitors there is a general feeling of exasperation against the French for the way they have grabbed all the advantages themselves, including an absurdly large portion of the limited space at their disposal. Their greed contrasts most unfavorably with the temper displayed at Chicago, where all that was possible was done to place the visitors on more than equality with the native exhibitors.

In details of organization, too, the French have already fallen short, to the surprise of everyone, and general interest here in the exposition is being crushed out of existence. I am glad to hear that Commissioner-General Peck succeeded in increasing the American allotment, but I trust sincerely that the extra space is not at Vincennes, as in that case it is practically useless.

The American representatives reported on their return from Paris that they had been treated with

great courtesy and that the exposition management had gone to great pains to satisfy every wish that the Americans expressed. Consequently, the very best of feeling prevails.

At the meeting of the Northwestern Electrical association this week it is believed that the question of discontinuing the summer meetings of that organization will be considered. Some of the more conservative members express the belief that one meeting a year is enough, that the summer gathering is merely a pleasure party and that there is danger of these "excursions" becoming so expensive that members may find it burdensome to participate and may withdraw entirely from the organization. It would seem, however, as if the fears of this element were groundless. The organization has the remedy at hand whenever a plan is proposed that will severely tax the resources of the least prosperous member. It can always control the expenses, as it selects the place of meeting, and its members are familiar with the hotel rates and railway fares that they will have to pay. It has never been the aim of the association to encourage expensive meetings. The summer conventions have afforded an opportunity to spend a pleasant holiday in congenial company without entailing heavy expense, and there is no doubt whatever that they form a very popular feature. The fraternal spirit that is encouraged at these meetings is a valuable factor in promoting the work of the organization, and it is feared that the association would suffer greatly if the summer meetings should be discontinued. Aside from the social and commercial side of the question, there is also the consideration of the technical work done at these meetings. Some of the best papers that have been read at the Northwestern meetings were presented at summer gatherings, and there is no reason why important contributions should not continue to be made on these occasions. In presuming that these events are to be devoted entirely to social affairs, a grave mistake is made. The association can make them whatever it pleases, and whatever plan it may adopt it is bound to prove successful.

Trusts and combinations, consolidations and absorptions are the rule in trade to-day. The electrical industry is just now interested in the operations of a powerful syndicate that appears to be engaged in securing control of all the profitable street railway and lighting properties in the country. Many combinations and consolidations have been effected already, and as concessions in the form of transfers are generally given in the case of street-railway properties, and improved service or reduced cost in lighting systems, there has been no public protest. As a matter of fact, the equanimity of the people may best be explained by the fact that general trade conditions have been materially improved and that there is plenty of work to be had at fair wages. The average American workman is not disposed to quarrel with his neighbor or his employer for making a satisfactory trade or a profitable investment, but rather rejoices in the good fortune of others as long as he is permitted to earn a fair living. To-day the conditions are ripe for the execution of large financial undertakings, and the electrical industry presents an inviting field for operations of this kind.

These combinations are not confined to the operating companies, however. Manufacturing interests are consolidating or working under agreements that virtually control special lines. At the present time wire trusts, carbon trusts, copper trusts and similar combinations are engaging public attention. Some of these may succeed, but as there has been a liberal allowance of water in one case at least, it is not expected that it will prove as good an investment as the public might believe. Then, too, where these conditions obtain there is always the danger of promoters starting companies merely for the sake of selling out. When combinations are effected on conservative lines, the great saving in cost of production may warrant a slight inflation of the value of securities and permit a reduction in selling price at the same time to prevent successful competition. But another policy has been adopted in one of the most prominent combinations recently announced, and the outcome will be awaited with considerable interest by those familiar with the conditions.

Northwestern Electrical Association.

A large party of electrical men assembled at the Northwestern railroad depot in Chicago on Wednesday morning, January 18th, and under the guidance of Messrs. Wolff, Low and Whyte started for Milwaukee to attend the convention of the Northwestern Electrical Association in that city, January 18th, 19th and 20th.

The headquarters of the association during the convention were established at the Hotel Pfister, and the meetings were held in one of the parlors. Other parlors and considerable space in the rotunda and halls were occupied by exhibits.

"Trend of Central Station Design," by B. J. Arnold of Chicago.

"Meter-rate Systems," by E. L. Debell of Sheboygan, Wis.

"Design of Secondary Circuits in Alternating Plants," by George L. Thayer of Belle Plaine, Ia.

"Electricity Direct from Coal," by Professor A. J. Rogers of Milwaukee.

"Inductive Loads on Alternating-current Transformers," by Professor D. C. Jackson of Wisconsin University, Madison.

"Electric Vehicles and Their Relation to Central Stations," by H. M. Maxim of Hartford, Conn.

"Association Management," by H. L. Doherty of Madison, Wis.

As usual, the entertainment committee prepared several attractive features for the visitors, including a theater party, sleigh-ride and lecture, in addition to the annual banquet.

Patent Court Proposed.

[Special correspondence of the Western Electrician.]

Washington, D. C., January 16.—During the last session of Congress, Representative Hicks, chairman of the committee on patents, introduced a bill providing for the establishment of a court to be known as the Patent Court of the United States, to consist of a chief justice and two associate justices.

The bill provides that whenever an application for a patent is filed in the Patent Office which, in the opinion of the commissioner of patents, interferes with any pending application or with any unexpired patent, he shall give notice thereof to the applicants or applicant and patentee, as the case may be, and shall direct the examiner of interferences to proceed to declare the interference and to settle and determine all interlocutory matters and motions.

The court shall, on receiving from the commissioner of patents a certificate of any interference case, set a time to take testimony. On the evidence produced the court shall hear and determine the question of priority or originality of invention between the parties on the issue certified to the court by the commissioner of patents, and then return to the commissioner a certificate of its proceedings and findings, which shall be recorded in the Patent Office, and if such adjudication be in favor of the right of an applicant, shall authorize the commissioner to issue a patent on the application, provided such applicant complies with the requirements of law.

Telegraphing Irish.

The Westminster Gazette says the Irish postoffice officials have accomplished a feat which deserves more than passing recognition. There has just been concluded at Letterkenny, County Donegal, an Irish festival, which lasted for a week. It was decided by the promoters that the occasion should be taken advantage of for encouraging the revival of the Irish language.

kenny staff, when dealing with the first section of the work in Irish, not knowing of the special arrangements at the general postoffice, made inquiry, if the words were accurately received, and were rather surprised to receive a satisfactory answer in Gaelic along the wire. The work was sent rapidly and accurately, and the Irish telegraphists engaged in it are to be complimented on the capacity they displayed to meet the emergency.

Death of M. C. Bullock.

The death of Mr. Milan C. Bullock, the president of the M. C. Bullock Manufacturing company, at his home in Chicago on January 12th, removed a man who was not only widely known as a manufacturer of engines and mining machinery, but who was a pioneer in the electric-lighting business of the West as well.



M. C. BULLOCK.

after that, directly engaged in the electrical business.

Mr. Bullock was a native of New York state, and in his first year. He learned the machinist's trade and displayed great aptitude in it. From 1863 until 1870 he worked in a number of shops, gaining a constantly increasing experience. In 1870 Mr. Bullock became connected with the diamond-drill business. In this he distinguished himself by making notable improvements, and he was connected in important capacities with several companies until 1875, when he went to Chicago and engaged in business for himself on a small scale.

Mr. Bullock was a cheerful, energetic, resourceful man and stood high in the opinion of his associates. He was a member of the Union League Club. A widow and two daughters survive him.

New York Electrical Society.

Standing room only could be had by the latecomers at the meeting of the New York Electrical society, at the College of the City of New York, on

January 12th. The subject of the evening, which was "Latest Progress in Storage-battery Installation," was ably handled by Mr. Joseph Appleton, engineer of the construction department of the Electric Storage Battery company. The meeting was a significant illustration of the number now interested in storage-battery application, and the audience listened with close attention to Mr. Appleton's record of the triumphant way in which the storage battery has vindicated the faith of its friends through years of doubt and opposition.

After the discussion in which Mr. R. P. Bolton, Mr. Frank J. Sprague and Mr. C. O. Mailloux took part, the gentlemen present visited the storage-battery power sub-station of the Metropolitan Street railway company, at the foot of West Twenty-third street, where was seen in operation the large railroad battery of the company, equipped with all the modern appurtenances.

The following-named members were elected: Arthur D. Dunn, Harvey E. Mole, James A. Stiles, Henry I. Lurye, Walter S. Wilson, A. Haaber, Eugene F. Roeber, Herbert Jenkins, George V. Flynn, Arthur Diamant.

Chicago City Railway Company.

The annual meeting of the Chicago City Railway company was held on Monday, June 16th. The election of officers resulted in the selection of M. K. Bowen as president, Joseph Leiter first vice-president and D. G. Hamilton second vice-president, T. C. Pennington treasurer, F. R. Greene secretary, and G. O. Nagle superintendent. William B. Walker resigned the first vice-presidency of the company and Joseph Leiter, second vice-president, was promoted to fill his place.

President Bowen submitted a report containing the following summary of the affairs of the company:

Table with financial data including revenue, expenses, net gain, and total earnings for the Chicago City Railway Company. It lists various metrics like passengers carried, revenue from different lines, net gain, and total earnings with their respective values.

American Street Railway Association.

Representatives of Chicago street-railway interests have at last taken steps toward preparing for the meeting of the American Street Railway Association in this city in the Fall. An informal meeting of representatives of all the street-railway companies of the city was held on Tuesday and a committee was appointed to select a place for the meeting and make provision for holding a large exhibition.

DEVELOPMENT OF THE TELEPHONE FIELD.

Telephone News from the Northwest.

[From the Minneapolis correspondent of the Western Electrician.]

The Mesaba Telephone company has completed connection between Eveleth, Virginia and Sparta, Minn.

The Litchfield Telephone company has completed toll lines from Litchfield to Manannah and Grove City, Minn.

The Fergus Telephone company of Fergus Falls, Minn., has equipped its exchange with a motor for ringing bells, instead of making the operator do it, and a call is made by touching a button.

The telephone company at New Richland, Minn., is erecting a building for a central office.

F. F. Murray and Charles Avery of North Branch, Minn., contemplate a telephone line to Wolf Creek. They are securing subscribers for a local exchange.

The Northwestern Telephone Exchange company will extend its wires north from Jamestown, N. D., to Leeds, south to Oakes and west to Mandan, N. D. A line will also be constructed from Cooperstown to Sanborn.

The Hutchinson (Minn.) Telephone Exchange company has been incorporated, with \$2,000 capital stock, to put in an exchange.

The Winona Telephone company of Winona, Minn., will put in a new switchboard in the spring.

A resolution has been introduced in the council of Duluth, Minn., asking the senators and representatives in Congress from Minnesota to use their efforts to secure legislation which shall prevent telephone companies from taking a right-of-way on post roads in cities until they shall have obtained a franchise from the city. It is reported that the Duluth Telephone company proposes to continue in business after the expiration of its franchise, if it is unsuccessful in bidding for a new one, under the act of Congress of 1866. The company denies it.

The Cedar Valley Telephone company is equipping its exchange at Cedar Falls, Ia., with a power generator to do the ringing.

Ackley, Ia., will vote February 7th on granting a franchise for a telephone exchange to the Iowa Telephone company.

A telephone line is projected from Marengo, Ia., to Genoa Bluffs and the prospects are favorable for its construction.

The Early Telephone company has been formed at Early, Ia., and 14 instruments are in use. In the spring a toll line will be run south of the town.

The Spencer Telephone company has been refused a franchise at Spencer, Ia., by the electors of that town.

Telephone connection is now complete between Helena, Mont., and Portland, Ore.

The Citizens' Telephone company of Mankato, Minn., will be defendant in a suit for \$15,000 damages, received by Walter Voebeck, by having his hands caught in a pulley on a pole of the company. The boy's mother will also sue for \$2,000 for injuries received at the same time. A lineman fell from a pole of the company recently and broke two ribs.

The Home Telephone company, which operates a telephone line between Montgomery, Minn., and Le Sueur Center, has declared a 40 per cent. dividend.

Aris & Co. have completed a telephone line between Kettle Falls, Wash., and Meyers Falls.

A telephone exchange is being formed at Hoquiam, Wash.

Boone, Ia., is said to have more telephones in proportion to its population than any city in Iowa.

The Fort Dodge Telephone company has completed its exchange at Fort Dodge, Ia., and has it in operation. There are 250 instruments in use.

The Clearfield and Mount Ayr Telephone company reduced rates for business and residence telephone service \$3 per year, making them \$15 and \$12 respectively.

San Diego, Cal., and Livingston, Mont., are the extremes of telephonic connection, being 2,161 miles apart.

The Iowa Telephone company will establish an exchange at Montezuma, Ia., at once.

Merchants of Duluth are quite anxious that the Central Wisconsin Telephone company shall extend its wires to that city, as the trade in northwestern Wisconsin is being cultivated.

The new telephone company of Oskaloosa, Ia., will soon be connected with Des Moines and intervening points.

The Ottumwa (Ia.) Long-distance Telephone company is extending its lines to Bloomfield, Ia., by way of Keosauqua and Centerville.

There is talk at New Richland, Minn., of putting a new telephone line through that section next season.

The Audubon and Kimballton Telephone company has been incorporated at Audubon, Ia.

Mitchell, S. D., now has long-distance connection over the lines of the Western Electric Telephone company.

The Northwestern Telephone Exchange company made a proposition to the County Board at Winona, Minn., to furnish telephone service at the rate of 50 cents per month for each instrument in the court house. The company claims a list of 300 subscribers and offers a three-year contract at that rate. About 50 miles of new telephone wires have been

put up in Waukesha County, Wis., during the last year.

St. Paul is complaining about the telephone service rendered by the Northwestern Telephone Exchange company, and anxious inquiries are made for the Mississippi Valley Telephone company's promised exchange. The officers of the latter company say that they have been delayed in getting materials, but will have an exchange in operation by July 1st.

The county commissioners at Winona, Minn., rejected a proposition of the Northwestern Telephone Exchange company to place an instrument in the courthouse free of charge.

Chess contests by telephone are being planned at several points in Iowa.

The new telephone exchange at Fort Dodge, Ia., has begun operations with 250 instruments in use.

Experiments have been made on the wires of the Great Northern railroad at Crookston, Minn., with a view to using the same wires for telephone and telegraph. The experiments have been successful, and Larimore, N. D., and Crookston have talked together. Heavy induction coils and condensers were attached.

The Rocky Mountain Bell Telephone company has completed connection from Missoula, Mont., through Wallace, Idaho, to Portland, Ore.

The new telephone exchange at Manson, Ia., has been put in operation.

The Little Wolf Telephone company has applied to the council of Appleton, Wis., for a local franchise and proposes to put in an exchange with 200 subscribers.

Telephone connection has been completed between Armour and Edgerton, S. D.

The threatened litigation in the matters of the Perry Telephone company of Perry, Ia., has been withdrawn and the differences settled out of court. George Bandy is now sole owner.

The Crookston Telephone company contemplates a toll line from Crookston to St. Vincent, Minn., and another to Red Lake Falls and St. Hilaire, Minn., next season.

Mount Ayr, Ia., will vote March 29th on granting a franchise to the Iowa Telephone company.

A telephone exchange is being installed at Dyersville, Ia.

The Fairmont Telephone company of Fairmont, Minn., has declared a dividend of 17 per cent. on the year's business. The company has 148 instruments in use in Fairmont, 48 at Welcome, 21 at Sherburn, and has orders for 30 each at Lakefield and Heron Lake, Minn.

There is a rate war on at Chippewa Falls, Wis., between the Chippewa Falls Telephone company and the Wisconsin Telephone company.

The Interstate Telegraph and Telephone company has been incorporated at Lakeland, Minn., to connect Hudson and New Richmond, Wis., with the Twin Cities. Contracts are let for the work, and it will be rushed to completion.

The Chequamegon Bay Telephone company is arranging to lay a submarine cable from Bayfield, Wis., to La Pointe, on the bottom of the bay, and also a line to Madeline Island.

The Standard Telephone company of Waukon, Ia., declared a dividend on the last year's business of 20 per cent. The capital stock was raised from \$25,000 to \$50,000.

The Hanamo Telephone company, the Conway Telephone company and the Savannah Telephone company have been consolidated into what is known as the "Hanamo system," with headquarters at Marysville, Mo.

The Iowa County Mutual Telephone company has been organized to build a telephone line from Marengo, Ia., to Genoa Bluffs.

The council of Fremont, Ia., has passed an ordinance providing for the construction of a telephone line by a company of citizens.

The Mutual Telephone company of Des Moines earned \$28,860 during the last year and had expenses of \$12,065. The company will refund \$20,000 worth of eight per cent. bonds and float a six per cent. issue.

The council of North Mankato, Minn., has awarded franchises to both the Citizens' Telephone company and the Northwestern Telephone Exchange company. The former thought it should be given an exclusive right, as it is a home company and has forced a reduction in tolls, but the council did not see it that way.

Russia's New Telephone Line.

The official inauguration of the new telephone line between Moscow and St. Petersburg took place January 12th. The line alone cost 60,000 rubles (\$20,400). In the exchanges at all stations American telephone apparatus is used exclusively.

The telephone is gaining popularity in South Africa. The Cape Times says: "It is understood that the postal authorities have under consideration a proposal to connect the leading towns in the Eastern Province by telephone. The connection will be applied to Port Elizabeth, Graham's Town, King William's Town, East London and Queen's Town."

Cost of Telephone Service.

A commission composed of John W. Hulse, J. M. Wilson, A. S. Worthington and A. A. Birney of Washington, J. W. Farnham of Boston and C. D. Haskins of Chicago is engaged in taking testimony upon the cost of building, equipping, maintaining and operating a telephone exchange under conditions similar to those existing in Washington. The commission visited Detroit on Monday, came to Chicago the following day and will next appear at St. Louis and Pittsburg. Several witnesses were summoned to appear at the offices of the Western Telephone Construction company, Chicago, where the meetings were held, and they were examined under oath.

The appointment of this commission was the outcome of the controversy in Washington and the litigation growing out of the attempt to enforce the provisions of the law placing the maximum rate for service in the District of Columbia at \$50. The company contended that it could not comply with the terms of the law, and insisted on running the business in its own way. When it attempted to remove instruments where subscribers had refused to pay more than \$50, injunctions were taken out and criminal proceedings were instituted against President Bryan.

The Bell people say that an expenditure of \$100,000 will be required to install the necessary equipment to take care of the large number of subscribers that a cut in rates would bring them, and therefore they refuse to make the reduction.

The independent manufacturers contend that the requirements of Washington service can easily be met on a \$50 yearly rental basis, and in evidence of good faith they stand ready to take the franchise off the Bell company's hands any time the latter fears it is going to lose money at the prices mentioned.

Telephone War in Detroit.

[Special correspondence of the Western Electrician.]

Detroit, January 16.—The fight between the Bell and the independent telephone companies of the state has already opened, and the old concern has made the first move. Saturday the Bell company started advertising a rate of \$1 per month for house and \$1.50 per month for business one-way telephones. This means that the subscriber can call up any number in the directory, but cannot himself be called. Several telephones are placed on each line.

The Michigan Telephone company, which operates the Bell exchange, has a very nice contract to go with this offer. It provides for the use of the telephone at this rate for three years, with the direct understanding that if a regular telephone service is desired, the customer must use a Bell instrument. It is said the company secured several hundred orders within a few days.

As it is now, the Bell company's rates are \$1 below those of the Detroit Telephone company (independent) on house telephones and \$4 on office telephones, being \$24 and \$36 respectively. The officers of the Detroit company claim that the new move will not injure the independent company, as it has enough contracts on hand to keep running for several years yet, even though no new orders are taken. As a matter of fact, the Detroit company has more subscribers on its books, by one-third, than the old company.

Michigan Telephone Stock at 50.

It will be interesting to independent telephone men to learn that in spite of the pretensions of the Bell interests the value of Michigan Telephone company securities have greatly depreciated, and that the recent transfers were made on the basis of 50 per cent. of face value. It is understood in financial circles that the Erie Telegraph and Telephone company, which controls the Cleveland company and several other operating companies, purchased a large number of shares of the Michigan stock at the price mentioned from a Chicago capitalist. The gentleman in question has large investments in Chicago Telephone securities and other electrical enterprises and has held the Michigan stock for a long time, but finally came to the conclusion that it would be useless to wait longer for a return to its old value. Other Chicagoans, believing that this was a good bargain, accepted similar terms, and it is believed that more of the stock can be secured at the same figure if the eastern capitalists desire to purchase it.

Patent Office Decision.

A recent Patent Office decision on heavy current protectors will prove interesting to managers of independent exchanges. The suit at issue, which has been pending about two years, is an interference brought by Frank B. Cook, vice-president of the Sterling Electric company, and involves the broad patent No. 544,368, owned by the Western Electric company, to which it was assigned by F. R. Mc-Berty. The decision rendered is in the plaintiff's favor on every point. The protector in dispute is the one so largely used by Bell telephone companies, and more recently furnished independent companies by the Sterling Electric company of Chicago.

Southern Telephone News.

[From special correspondents of the Western Electrician.]

The Cumberland Telephone and Telegraph company of Nashville, Tenn., on reaching Port Gibson, Miss., with its long-distance lines, bought out the Claiborne Telephone company of that place. The Claiborne company was a small concern, having about 30 local subscribers and eight or 10 in the adjacent territory. It was preparing to extend its service to more local subscribers and to other points. For the latter reason, the Cumberland, apparently, bought it out.

The citizens of Greenville, Miss., are agitating the question of an opposition exchange. Nothing definite has, as yet, been done.

The Cumberland Telephone and Telegraph company, which is a Bell concern, continues its residence rate at 50 cents per month at Vicksburg, Miss., and has a considerable number of subscribers on these terms, thus enabling it to hold the business people at \$3 per month. The Citizens' Telephone company, however, is constantly gathering in new subscribers at standard rates, having about the same number of subscribers as the Cumberland, notwithstanding the cut rate of 50 cents for residences, which also applies, when necessary, to business.

The Brookhaven, Miss., company, an independent company, has just sold its local exchange to the Cumberland company, which had nearly reached that point with its long lines. The Brookhaven company had only a small exchange and was not especially successful, but as it occupied a good point (a county seat) for long-distance business it was desired by the Bell people. This deal will have practically no effect on the independent companies north and south of Brookhaven.

The Citizens' Telephone company of Crystal Springs, Miss., has recently added considerably to its out-of-town lines and to its local subscribers. It has one of the best constructed exchanges in the state.

The fight between the Cumberland (Bell) company and the People's (independent) company still continues with unabated interest at Jackson, Miss. The old concern offers the 50-cents-per-month rate to all classes, while the latter continues slowly to increase its already large list of subscribers at its original rates. On the Cumberland's recent attempt to resume collecting for business telephones at \$3 per month, all the wholesale grocers, save one, and all the retail grocers, save three, discontinued the service. The leading railroad and some other important connections also discontinued the Cumberland service.

The Canton, Miss., Warehouse and Telephone company is threatened with an opposition exchange by the Cumberland (Bell) company, the latter having lately completed its through lines beyond that point. At latest accounts the Bell exchange had not materialized, though some lines have been strung through the town.

The opposition exchange at Meridian, Miss., continues to sustain itself in open and active competition with the Cumberland company. It has been recently incorporated.

The T. J. Long telephone exchange of Athens, Tenn., will in the future be known as the Athens Telephone company. It will make extensions and improvements in the equipment and service.

Extensions and Improvements.

The Hughes Telephone company is building a telephone line from Hillsboro, Ore., to Astoria. It will be completed in a few weeks.

George Bush, assistant superintendent of the Oregon Telephone and Telegraph company, is completing arrangements for connecting by telephone all the inland towns of eastern Oregon.

Dr. Wood, the telephone man of Moscow, has numerous telephone lines projected, one of which will extend from Florence, Idaho, to Buffalo Hump, which will be constructed early in the spring.

Among the Illinois incorporations formed last week was the McLeansboro Telephone company, with capital of \$10,000, to equip and operate a telephone exchange. The incorporators were F. H. Stamper, R. A. Youngblood, C. C. Cantrell.

The Metropolis, Ill., Telephone company desires to be numbered among the faithful. It is pushing the independent telephone system at Metropolis, and its list of subscribers is constantly growing. The same company operates the exchange at Robinson, Ill.

A very neat directory of subscribers has been issued by the Mutual Telephone company of Shelbyville, Ind. It is arranged in convenient form and contains a very creditable list of patrons. Toll-line connections are furnished with other towns in the vicinity.

A contract has been made between A. W. Barrett and B. C. Haldeman of the Missouri and Kansas Telephone company and A. R. Urrea of the city of Mexico and W. W. Nelson of Kansas City, which is expected to result in the establishment in the city of Mexico of a police-telephone system.

The Rocky Mountain Bell Telephone company will connect Hailey, Idaho, with the long-distance telephone system. The line is proposed from the Utah and Northern Pacific railroad to Hailey. A line will be constructed from Boise to Canby Prairie, thence to Hailey, via the Gold Belt, then to the railroad at Blackfoot or Idaho Falls. Hailey will be the headquarters of the 300-mile line between the Utah and Northern and Boise. Construction work will commence shortly.

The Miami Telephone company, of which James T. Sanders is president and J. R. Dewy secretary, has just been organized in Miami, Fla., and will begin the work of installing a plant at once. The poles, wires, telephones and station equipments will be on the ground in a few days, and it is expected that the system will be in working order within the city limits by February 1st. The line will be extended to the suburban towns of Lemon City and Coconut Grove as soon as the money can be raised for the purpose.

The news that the Erie Telephone people will string a No. 8 circuit to the copper district, connecting Houghton with Chicago, Detroit, New York and Boston, is received with pleasure in the copper country. The Houghton office of the Western Union Telegraph company now does the third largest business in the state of Michigan, and the pressure is steadily increasing. Orders going from Houghton for purchases and sales of copper shares on the Boston Exchange range from 5,000 to 25,000 shares daily, and the daily average volume of transactions on the Boston Board for Houghton customers has probably averaged very nearly \$500,000 for the last two months.

The New Ulm Telephone company of New Ulm, Minn., has increased its capital stock from \$10,000 to \$20,000, and will commence building toll lines in the spring. To the present 50 miles will be added about 100 miles more, which will give the company connection with Tracy, Redwood Falls, Mankato, St. Peter, St. Paul and Minneapolis and all points on the Minneapolis and St. Louis railroad in Minnesota, connecting with most of the important toll lines in the state. The company is using copper wire only on toll lines, and it has put up only substantial lines. It now has 135 paying subscribers in New Ulm and small exchanges in Sleepy Eye and Springfield.

At the annual meeting of the stockholders of the Wood County Telephone company at Grand Rapids, Wis., A. L. Fontaine was elected president of the board of directors, T. A. Lipke secretary and F. E. Kellner treasurer. This is an independent company, working in opposition to the Wisconsin Bell Telephone company. It has been in operation for a little over 2½ years, with 200 instruments and 100 miles of line outside of the city, taking in all the surrounding villages. It contemplates building a line to Marshfield in the spring, which, with the connections that city will soon receive, will give the Grand Rapids (Wis.) concern connections with the whole Wisconsin valley. The Wood County Telephone company is said to be one of the strongest organizations of its kind in the state.

A visitor to the factory of the Victor Telephone Manufacturing company of Chicago would notice that during the last year remarkable progress has been made in increasing the output of the factory and improving the company's apparatus. The Victor company recently issued an artistic circular describing in detail the Victor switchboard apparatus

and its subscribers' outfits. One of the most recent improvements relate to the construction of the Victor drop coil. These drop coils are fastened with small lugs to the binding-post by crew, which extend into borings in the binding-post. The connections of the five jack and drop sections to the line circuits are made in exactly the same manner, thus doing away with all soldering inside the switchboard cabinet and enabling a drop coil to be removed and another inserted in 30 seconds, and a five-jack and drop section in one minute. The Victor company recently closed contracts for four boards with the Slate Belt Telephone company of Nazareth, Pa., a 200-drop board and all equipment for Mitchell, S. D.; a 200-drop board in Paxton, Ill., another in Bunceston, Mo., and a 400-drop exchange in Ashland, Wis. Manager Blaine State that the company's sales recently ran up to 1,200 drops and 900 telephones. As a consequence the company has just contracted for an additional floor space of over 10,000 square feet, which will give the Victor Telephone company one of the largest factories in the United States.

Opposition to Bell Service.

The prospects of competition in telephone service in Chicago have awakened considerable interest in the subject, and the Tribune has secured reports from other cities in which independent companies have been established. Following is a brief summary of the conditions, as reported:

In Detroit the Bell company charged a minimum of \$48 for residences and \$75 for business telephones two years ago. The average rate now is \$24 for residences and \$36 for business places. The new company, the Detroit Telephone company, began business two years ago and cut the rates to \$25 and \$40 respectively. The new company is giving fair service, which is expected to be improved. The company has 5,000 telephones in Detroit, while the old company has 4,000.

Indianapolis is the center of the opposition companies of the state. The new company first secured 3,000 subscribers, who signed contracts for three to five years' service, which is a larger number than the Bell company is now serving. The average rates of the Bell company are \$48 a year for residences and \$60 a year for business houses. The new company cut these rates. The opposition now extends to perhaps 30 cities in Indiana, all of which are being rapidly connected with the new central office in Indianapolis.

Fort Wayne has reaped considerable benefit from the war between the Central Union Telephone company and the Home company. In 1879 a telephone company acquired a perpetual franchise for certain streets, and it is under this franchise that the Central Union to-day works. Until 1896 this company had a monopoly. The rates charged were \$36 per annum for residences, \$48 for business houses. In 1896 the Home Telephone and Telegraph company, an independent concern composed of local business men, secured a 50-year franchise for the city streets. It agreed to place wires underground in certain districts, to give concessions to the city in the way of free telephones, to pay to the city two per cent of the gross receipts after January, 1900, to furnish telephones at a rate not greater than \$36 per annum for business houses and \$24 for residences, or at both place of business and residence, \$48 for both. This gave the residence telephones at virtually \$1 a month. The company began to operate in 1897, and the Central Union at once put instruments in business houses at \$24 per annum and residences at \$10. The Home company made no cut, but the people gave their support to it, and it was but a short time till it led in the number of subscribers. The Central Union finally put telephones in many residences and business places, charging nominally a rental, but collecting nothing, and thus the case stands. The Home company has more than double the subscribers of its competitor.

New Orleans' telephone service until recently was supplied by the Great Southern Telephone and Telegraph company, but that concern has been merged into the Cumberland Telephone company. Until five years ago the rates for business telephones were \$120 per annum. The residence rate was \$30 less. The business men threatened to organize an opposition company. This resulted in a reduction of rates for business telephones to \$96. About six months ago Detroit capital organized the People's Telephone company, which announced that it would give business telephones for \$60 and residence telephones for \$30. The Cumberland people met this cut, and the new concern announced a further reduction, which has also been met, and now both are offering business telephones to the community for \$3 a month and residence telephones for \$2.50 a month.

Rates in Cleveland have been governed largely by the introduction of what is known as the Cory line, which serves a number of subscribers, and can be secured in a residence at a minimum rate of \$1.50 a month. Every message, however, which is sent over a Cory line can be heard in every residence in which there are branches. The best telephones are not much cheaper than three years ago. Telephones for residences are little used. It is probable that the competition which the Home Telephone company, now the Cuyahoga Telephone company, promises when it becomes established will insure cheaper service.

New England Telephone Notes.

[From the Boston correspondent of the Western Electrician.]

The American Bell Telephone company has sold since January 1st, to Boston bankers, \$3,000,000 four per cent, 10-year debenture bonds, being part of an issue of \$10,000,000, of which one-half was disposed of, bearing date of July 1, 1898. This leaves \$2,000,000 to be issued.

Steps have been taken to establish a rival telephone company in Connecticut, to form the connecting link between Boston and New York, it is reported, some of the same people who are back of the new local enterprise being named in connection with a New Haven project. The same incorporators are interested in the Boston and New York Telephone and Telegraph company, which was incorporated in New Jersey about three weeks ago. The capital in the latter instance was given as \$1,000,000. The application of the Massachusetts Telephone and Telegraph company for permission to issue its first \$10,000 of stock has been filed with the commissioner of corporations.

It is announced that the American Bell Telephone company is considering the advisability of establishing its headquarters outside of Massachusetts. The laws of Massachusetts provide that no corporation shall contract an indebtedness beyond 50 per cent, of the par value of its stock. With a capital of about \$25,000,000, as at present, or even \$30,000,000, as it would have to be to meet the proposed extensions this year, the company is permitted to issue only \$12,000,000 or \$15,000,000 in bonds, although Bell stock is selling at nearly \$75,000,000. In moving to another state the share capital will, of course, be so arranged as to reduce the market price, dividends, etc. It is also said to be probable that stockholders will have a right to put money into their enterprise and take stock therefor.

There is a movement on foot to build a telephone line to connect with the Susanville line at Adin, Cal.

Chief Operator's Equipment.

The accompanying cut, Fig. 1, illustrates a very neat chief operator's desk that is being manufactured by the Sterling Electric company of Chicago. The chief operator's desk or toll board shown in the illustration is equipped for 20 metallic circuits. At the sides will be noticed a number of very convenient pigeon holes and other spaces fitted for the necessities of a busy operator. The switchboard proper is the usual Sterling board and is, as is now very generally known, made similar to the Bell apparatus.

Fig. 2 illustrates a very handsome 200-drop metal-

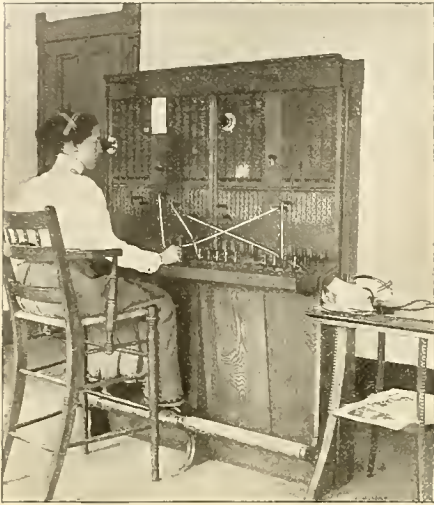


FIG. 2. CHIEF OPERATOR'S EQUIPMENT.—200-DROP METALLIC BOARD AT PONTIAC, ILL.

lic board that the Sterling company has installed at Pontiac, Ill. This board is fitted up with the Sterling company's improved type of Bell switchboard apparatus, and is the same as the standard Bell switchboard. The Sterling company says that it is exactly the same as a Bell board, as far as the ringing and listening key, the plugs, the cords and the pulley weights, which slide on guide wires; the



FIG. 1. CHIEF OPERATOR'S EQUIPMENT.—20-DROP METALLIC CIRCUIT, TOLL AND CHIEF OPERATOR'S DESK AT LAFAYETTE, IND.

drop-ringing arrangement and the transmitter support are like the Bell, and also the arrangement for wiring in the cabinet work. The chair and cabinet work for this switchboard are of a pattern that was especially designed by Chief Engineer Cook, of the Sterling company, when he held the same position with the Bell company as he does with the Sterling.

Underground Electric Road Proposed for Chicago.

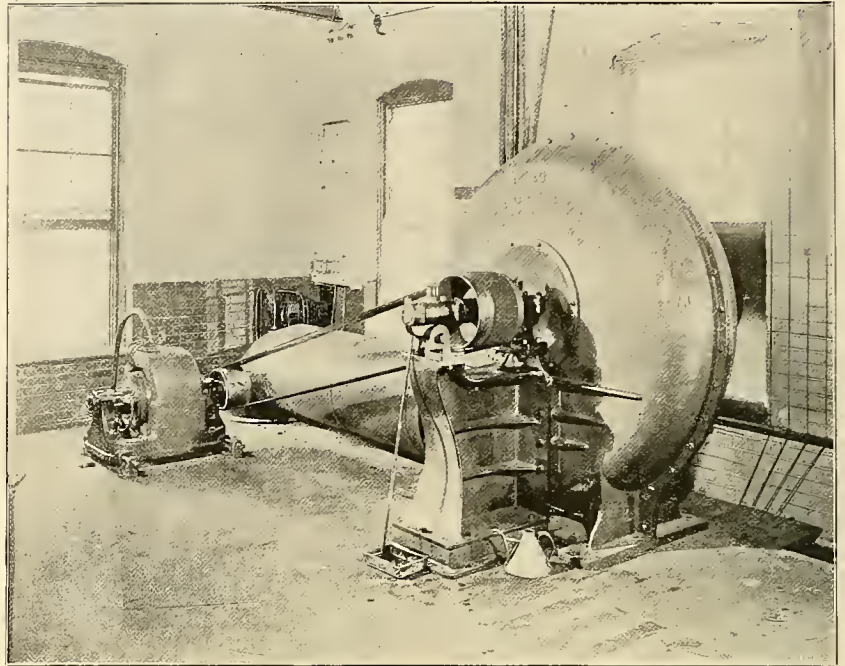
To secure factory terminal facilities in Chicago the Wisconsin and Inland Lakes Railroad company, which was organized to build an electric railroad from Chicago to the lake region of Southern Wisconsin, to carry both passenger and freight, proposes to lay its tracks in underground tunnels

in the city. The ordinance giving the necessary franchise is pending in the City Council. The route proposed is from a terminal station at State and Fourteenth streets underground to another station at North State and Kinzie streets, thence by a curvilinear route to Huron and Wells streets, thence, diverging to a point at about Franklin street, to Clybourn avenue, and thence to Center street, where the tracks cross to the West Side. It is proposed

at any height, without removing the wire from the poles, and does not interfere with the operation of the wire.

Electrical Ventilating Plant.

In the accompanying cut is illustrated an interesting installation of a single-phase alternating-current motor in a ventilating plant in St. Louis. The mo-



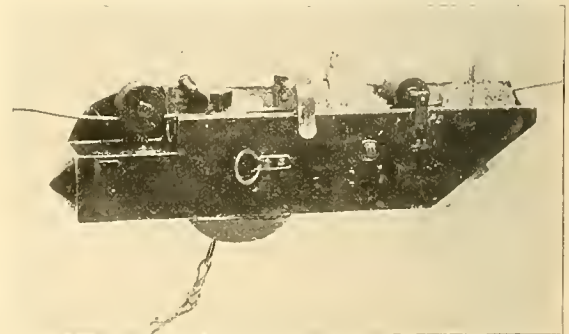
ELECTRICAL VENTILATING PLANT.

to run a branch from the Bloomingdale road out Western avenue to the northern limits of the city. President Case has promised aldermen who have discussed the matter with him that the tracks shall be underground in all parts of the city east of Pa-

tor was manufactured by the Wagner Electrical Manufacturing company, and is a standard type of this class of machines. In this special application a 20 horse power motor is belted to a 72-inch Sturtevant blower. This class of work opens a great field for this type of motor. It is also a character of work which the motor will be called upon to perform in operating pumps. The starting load comes on gradually, increasing to the full operating load as the combination approaches full speed. No trouble whatever is experienced in starting with the full blower opening.

Chicago Street-railway Affairs.

At last week's meeting of the Chicago City Council Alderman Kimbell made a new attempt to give the local street-railway companies the long-



INSULATED WIRE WEATHERPROOFING MACHINE.

desired extension of franchise under the much-discussed Allen law. The proposed ordinance would extend all the franchises until December 31, 1906. By a vote of 33 to 27 it was buried by reference to the city hall committee. One alderman remarked that while the members of the Legislature were tumbling over one another to repeal the Allen law, under which the ordinance proposed would be operative, the time was most inopportune for any legislation by the council.

A novel petition was received by the aldermen from H. W. Duncanson of 1076 Fillmore street, a real estate dealer, and Lamson Bros. & Co., a Board of Trade firm. The petitioners claim to represent \$35,000,000 of capital in Chicago and New York, and offered on behalf of the syndicate to buy the street-railway properties and franchises of Chicago lines as quickly as the latter expire, and name the terms on which they will agree to operate all street cars as one system for twenty-five years. Universal transfers are to be given throughout the city from one division to another. The regular fare is to be five cents for a single trip in one continuous direction, but 10 tickets can be bought of conductors for 30 cents, good between 5 and 7 o'clock at night and 6 and 8 o'clock in the morning for all persons. The syndicate will agree to pave and keep in repair 16 feet in the center of

cific Junction. A good rate of speed in the tunnels is promised.

Insulated Wire Weatherproofing Machine.

Lewis & Buehl of Sycamore, Ill., are putting upon the market the entirely new machine illustrated. Every person interested in insulated wire is asked to take time to thoroughly investigate its merits. It is a well-known fact that the life of insulated wire depends upon the compound used to preserve the cotton from atmospheric changes. This machine allows the use of slow-drying soft insulating compound, and it gives the wire a thorough coating. The machine is simple in construction and does its work quickly, easily and at a moderate cost. It applies the compound to any sized wire or cable

the street where there is a double track and eight feet where there is a single track. The city is given the right of purchase at the end of the twenty-five-year franchise, the price to be fixed by five appraisers. This petition was also referred to the city hall committee.

Alderman Alling secured the reference to the finance committee of an ordinance creating the position of street-railway expert, to be appointed by the mayor, at a salary of \$200 a month, to collect statistics and other information, the expert to hold the office during 1899.

INDUSTRIAL COMBINATIONS.

The General Electric company of Minneapolis has been incorporated under the laws of New Jersey, with a capital of \$2,100,000. It succeeds a company of the same name, and the articles provide for doing business in every line of electric utility and in all parts of the world. It has been rumored that it is to be the "starter" for an electric combination which should include a large number of electric-light and street-railway companies. The officers of the company say that it simply means that some of the local stockholders have sold their holdings and new capital has come in.

The North Hudson County Railway company, which, starting from the Hoboken ferries, controlled the surface roads tapping all the northern part of Hudson County, N. J., has passed under control of the North Jersey Street Railway company, and the chain of electric railroads through the northern part of New Jersey is now practically complete. The North Jersey company has now swallowed up almost every one of the important existing lines in Hudson, Essex, Passaic and Union counties. It is said that the North Jersey company paid the three controlling owners something in excess of 160 on stock purchased at about par.

The Boston Light, Heat and Power company, which recently secured the Clinton, Mass., Electric Light company by purchase, is looking over the plant of the Spencer, Mass., company, and is also said to be negotiating for the Portsmouth, N. H., company's plant. The absorbing corporation, which had secured a number of other plants prior to getting possession of the Clinton establishment, is capitalized at \$2,000,000, and George F. Blake, president of the Blake Pump Manufacturing company, is at the head of it. Among its acquisitions are the Milford and Lowell plants in Massachusetts and the electric-light plant in Easton, Pa.

Very interesting reading is furnished by the "Trust Extra" of the India Rubber World of New York. The story of the relations of the proprietors of that journal to the promoters of the proposed rubber trust and also to each other forms an interesting and instructive episode in American business life. The narrative is too long to be given here, but as the India Rubber World—of which, by the way, Mr. John R. Dunlap of the Engineering Magazine is chief owner—has adopted an attitude of "outspoken opposition to the formation of the trust proposed," it is to be presumed that the "Trust Extra" will be sent to any applicant.

A Chicago daily newspaper prints a special dispatch from New York in which these statements are made: "A trust craze seems to have developed. In dozens of important industries men are traveling and telegraphing and telephoning to bring about consolidations of competing concerns. A table compiled by a local paper gives 92 trusts formed during 1898, and embracing every department of industry. Their aggregate capitalization is shown to be \$1,292,749,200, of which \$957,957,300 is common stock and \$334,791,900 preferred. Their bonded indebtedness will increase the total to over \$1,500,000,000. The total value of the United States wheat crop of 1896 is placed at \$310,602,530—less than one-third of the capital of the 1898 trusts."

The new National Carbon company has now, it is said, bought out the Globe Carbon company of Ravenna, O., and the Solar Carbon company of Pittsburg, the last two carbon manufacturers in the country not previously included in the combination. It is stated that of the \$4,500,000 preferred stock \$2,500,000 will be allotted to Chicago interests, including the electrical industry as well as financial circles. Cleveland and St. Louis take the balance. The entire amount was oversubscribed about \$2,000,000. The Chicago Tribune says: "The new company is unique in that it is an organization which controls not only all the producers of carbon in the United States, but it also embraces the big buyers of carbon. Nearly all the big electric companies, both power and light, of the United States are directly interested in the new company through their officers. It has the friendly co-operation and support of the capital interested in the electrical industries of the country." The new company is now incorporated. In addition to the gentlemen named as directors in the Western Electrician of last week are the following named: Hugh H. Hamill, Trenton, N. J.; A. M. Young, Brooklyn; John S. Bartlett, Boston, and A. J. Eddy, Chicago. The officers are: President, W. H. Lawrence; first vice-president, James Parmelee; second vice-president, E. D. Dickey; secretary, H. E. Hackenberg; treasurer, James Parmelee.

Necessity of Using Reasonable Care in Crossing Railway Tracks.

Mrs. Johanna Hickman recently obtained a verdict of \$7,500 for personal injuries against the Nassau Electric Railroad company of Brooklyn. She alleged that she was crossing Fifth avenue and Ninety-first street in the afternoon and looked each way and saw no car. She said, according to the New York Sun, that she wore an old-fashioned sun-bonnet that projected from her face, and that after she started to cross the street she made no effort to look either way. Other witnesses testified that the car was in sight. The decision was appealed, and the Appellate Division of the Supreme Court in Brooklyn reversed the verdict and ordered a new trial. Justice Woodward, who wrote the opinion, says:

"That the plaintiff has failed to meet the requirements of the law in establishing a lack of contributory negligence seems to us too plain to be disputed. To hold that a woman, 56 years old, in good health and the possession of her faculties, with an unobstructed view of a street-railroad track for a distance of several blocks, has met the obligation resting upon her of exercising reasonable care when she has glanced up and down the street from the sidewalk and then, with no further exercise of her faculties, walks slowly and deliberately upon the track, with an approaching car fully in view, with its bell ringing, is absurd. * * * The plaintiff had no right to assume that the car would be in such control that the motorman would be able to protect her against her own negligence. Nor was the motorman bound to assume that the plaintiff, in broad daylight, would continue to advance until she should be in a position of danger. * * * It is not enough that the plaintiff should merely look in both directions; she must look for the purpose of seeing if there is danger; and if her rate of progress in passing over the danger point is so slow that a car in traveling at a reasonable rate of speed may be reasonably expected to have come within view, and in such a position as to cause danger, she is not excused from the duty of using her eyes because she may, at some previous time, have discharged this duty. Plaintiffs have some duties to perform, and it is not proper that a jury should be allowed to speculate on the question of damages where the plaintiff has failed to show a compliance with the reasonable requirements of the law and that she has been free from negligence contributing to the accident."

National Electric Light Association.

The 22d meeting of this association will be held in New York, May 23d, 24th and 25th. Headquarters will be established at the Murray Hill Hotel, Fortieth street and Park avenue, where accommodations can be had on the American plan at \$3.50 and upward per day; on the European plan, \$1.50 and upward per day, according to room.

The Electrical Exhibition company will hold an exhibition at Madison Square Garden during the month of May, under the auspices of the association and in connection with the meeting.

Thawing Frozen Ground by Electricity.

Mr. Nelson Graburn, electrical engineer of the Montreal Street Railway company, has obtained a patent for a process of thawing frozen earth by the passage of a current of electricity. A syndicate with a capital of \$125,000 has been formed in London to exploit the process in the mining regions of the Klondike. The plan is to use the heat of a resisted electric current, instead of bonfires or heated boulders, in the shaft to thaw the ground. By this electric system it is claimed that almost all the heat energy can be applied just where it is required, without the great loss consequent upon other methods by radiation.

CORRESPONDENCE.

New York Notes.

New York, January 16.—Your Joseph Leiter seems to be largely interested in the International Air Power company and the New York Auto-Truck company, which were incorporated in New Jersey on Saturday. These two companies are authorized to manufacture, buy, sell and deal in compressed air, electrical machinery and apparatus, locomotives, engines, trucks and cars, and to manufacture all machinery for the supplying of electric, compressed air and other motive powers. It is said that the International company will manufacture the apparatus and that the Auto-truck company will use it in New York and elsewhere. The idea is to operate vans for heavy cartage traffic by compressed-air motors. Mr. Joseph H. Hoadley, an incorporator in both companies, is credited with this statement: "The auto-trucks are simply a localization of the railroad in force and hauling power. Take your average trucking wagon, which is six feet in length. Add another six feet for the team, and you have a hauling capacity of two tons to 12 feet. The auto-trucks are six feet in length, with a hauling capacity of eight tons. It's an easy proposition for a trucking man. The speed of the auto-trucks would be governed simply by the conditions. In round numbers there are 150,000 horses used in the

trucking business in the borough and Brooklyn. There were 10,000 horses used in this city on the street-car lines. Those horses were supplied by motive power and the system capitalized at \$200,000,000. At the same proportion a system which supplanted the use of 150,000 horses ought to be capitalized at 15 times as much. No explanation is made of the reference to electricity in the incorporation papers.

Joel C. Clark, secretary of the New York and New Jersey Telephone company, died at his home in Brooklyn on Wednesday morning last. Mr. Clark was born in Hallowell, Me., in 1842, but moved to Massachusetts early in life. He came to New York some years ago and became interested in the telephone business. He was one of the incorporators and a director of the New York and New Jersey Telephone company and of the New York and Pennsylvania Telephone and Telegraph company. At the time of his death he was secretary of the former organization and treasurer of the latter. Mr. Clark was a man of much culture, and had been a contributor to several magazines. A widow, five daughters and two sons survive him.

One of the papers prints a story about the transportation of freight over the trolley lines in Brooklyn. With the consolidation of the surface railroads it is thought to be practicable to operate electric freight cars at night for the benefit of manufacturers in the transport of goods, for the contractors who remove household ashes and refuse and for other purposes.

On the organization of the Legislature the speaker of the Assembly announced the following-named committee on electricity, gas and water supply: Messrs. Witter of Tioga, Fordyce of Cayuga, Hatch of Steuben, Brennan of Kings, Evarts of Orleans, Sloane of Schuyler, Appar of Westchester, Beebe of Essex, Sprague of Sullivan, McKeown of Kings, Kelly of Albany, Fitzgerald of New York and Gale of Queens.

An important decision was handed down at Albany January 10th by the Court of Appeals in the case of Oliver Ingersoll against the Nassau Electric Railroad company, in which the plaintiff sought to restrain the company from using the tracks of the Atlantic Avenue Railroad company on Bergen street, on the ground that a constitutional amendment of 1874 made the consent of the abutting property-owners a prerequisite to the operation of a surface railroad on the streets of a city, even though the cars were run upon the tracks of another line. The court refutes this contention, and holds that the act of 1839, which authorizes one railroad corporation to contract with another for the use of its road, is in full force and effect to-day. The opinion of Chief Judge Parker is concurred in by all the judges except Judge Vann, who dissents. Judge Parker says, in part:

"The constitutional amendment of 1874 was an attempt to place restrictions on the legislative power, but so far as the act of 1839 is concerned this constitutional provision had reference only to the building of new roads and the acquisition of new franchises. It aimed not at the destruction of vested rights such as the Atlantic Avenue railroad had acquired, either directly by overthrowing the statute or indirectly by compelling the assignee under the contract to obtain the consent of the abutting owners. Such consent was in fact given when the abutting owners first consented to the building of the railroad, for the consent was naturally given in the presence of a statute declaring that the franchisees would permit the corporation to contract with another corporation for the use of its road.

"If, then, it be true, as we shall attempt to show later that it is not, that the Legislature has since the constitutional amendment of 1874 attempted to deprive the Atlantic Avenue Railroad company and other surface railroad corporations similarly situated of a valuable part of their franchises, such legislation is unconstitutional and void. Salability is an essential element of property, and the destruction or diminution thereof is a taking of property that cannot be done except through the exercise of the right of eminent domain or of the police power. The salability of the property right in question is affected and its value diminished, if not destroyed, if the assignee thereof cannot make use of it without the consent of the abutting owners. It seems very clear to us that there is no statute that has for its purpose the cutting down of railroad franchises so as to eliminate therefrom the statute of 1839, which allows the contracting of one railroad company with another for the use of its road without acquiring anew the consent of the abutting property-owners thereto."

The court explains that the question here presented did not appear in the Kingston Colonial City Traction case, and that this is the first time it has been passed upon by the Court of Appeals of New York.

A man giving the name of Samuel Johnson was arrested in Newark last week for tampering with electric meters. He wired a shunt around the meter so that only a portion of the current consumed was measured. The arrest revives the question, Is electricity something that may be stolen? Philip N. Jackson of the Electric Light company said that it was proposed to make an example of Johnson, if possible, but that there was no special statute applying to tampering with electric-light wires and that they would have to prosecute him under the common law.

Northwestern Notations.

Minneapolis, January 16.—The electric-light company of Iowa City, Ia., has finally agreed to accept \$72.50 per light per year for a term of five years. The City Council contemplates submitting to popular vote the matter of a municipal electric plant.

Cedar Falls, Ia., voted an amendment to the franchise of the Cedar Falls and Normal Railway company by extending it five years, making it 25 years.

The big electric plant, operated by water power from Canyon Ferry, near Helena, Mont., has been put in operation. It is the hope of the company to extend wires to Butte, 40 miles, where the immense smelters can use all the power available. This will be done if the loss of power will not be too great for profit. It is estimated the cost of treating ore by this power will be reduced from \$2 to 75 cents.

The Citizens' Traction company of Oshkosh, Wis., may have trouble in getting into Neenah. The officials of that place demand that a car line be built to Riverside Park, and decline an entrance except on that basis.

The state Supreme Court has granted a rehearing in the matter of J. C. Flynn against the Electric and Water company of Little Falls, Minn. The question at issue is the reasonableness of a 30-year contract, which the council entered into.

The Gas and Electric Light company of Council Bluffs, Ia., has been sold under foreclosure proceedings. It was bought by a reorganization committee.

The Tri-city Railway company of Davenport, Ia., has made improvements to its schedule recently.

It is currently reported that Toledo, Ia., capital has purchased a controlling interest in the stock of the Toledo and Tama (Ia.) street-car system.

The electric-light system of Springville, Ia., has been completed and put in running order.

Fonda, Ia., contemplates a municipal electric plant.

The Centerville, S. D., electric-light plant is rolling up a monthly deficit of \$150, and the taxpayers are complaining.

The council of Albert Lea, Minn., has appointed a committee to report on the cost of a municipal electric-light plant.

The street-railway company of Dubuque, Ia., recently yielded to the demand of the city for a payment of its share of the paving tax for all streets north of Tenth, amounting to \$3,500.

The Water company of Davenport, Ia., has just installed a very complete electric-light plant for lighting its station.

The Waterloo and Cedar Falls Rapid Transit company, operating between those cities in Iowa, has leased all its property to the Cedar Falls and Normal Railway company. As the ownership of both companies is the same, the change is but nominal.

The electric-light plant at Warrens, Wis., has been completed and put in operation.

Fonda, Ia., will vote on January 23d on granting a franchise to a local company for electric lighting.

It is reported that the electric car line between Mason City, Ia., and Clear Lake will be extended to Fertile, and make a loop back over the present steam-car tracks to Mason City.

An electric-light plant will soon be installed on Government Island, at Rock Island, Ill.

The council of Albert Lea, Minn., has appointed a committee to ascertain the cost of a municipal electric-light plant.

A number of capitalists of St. Croix Falls, Wis., contemplate building an electric line to Balsam Lake, Wis., the new county seat.

The Mitchell Electrical company of Mitchell, S. D., has been incorporated, with \$75,000 capital stock.

Malcolm McDougall has been granted a franchise for a standard or street-car line, between Seattle, Wash., and Tacoma. Whether he proposes to use steam or electric power is unknown.

The electric-light plant at Red Lake Falls, Minn., is completed and in operation.

The change in the car line from Sioux City, Ia., to the suburb, Leeds, is giving the best of satisfaction. The line is shorter and has less curves.

The perennial rumor of an electric line from Minneapolis to Lake Minnetonka is again in evidence. The Twin City Rapid Transit company now has a line as far as Hopkins. The Great Northern railway has a line from Hopkins to Excelsior, on the lake, which it is about to abandon, owing to a change of route. The plan, as now announced, is for the street-railway company to equip the railway track from Hopkins to Excelsior for electric traction, and the deed is done.

L. A. Nixon was arrested at Blue Earth City, Minn., charged with tampering with the electric-light wires belonging to the city. He was bound over to the grand jury.

A bill has been introduced in the Minnesota Legislature providing for the execution of murderers by electricity.

An electric air compressor has been put in operation at Rockland, B. C., at the Mascot mine. It is said to be the first electric motor ever used for operating an air compressor to work satisfactorily.

Mayor Patzer of Bismarck, N. D., and others are interested in a project to construct an electric car line in Bismarck, to run between the Sheridan House and the capitol building.

A capitalist has been looking over the falls at Red Lake Falls, Minn., with a view to developing the power and transmitting it electrically to Grand

Forks, N. D. The cost of the plant would be about \$70,000.

Canton, S. D., has just had an electric-light plant put in operation.

J. E. Clarey, formerly editor of the Saturday Review in Des Moines, Ia., has been successful in a case involving the payment of \$1,000 to secure the silence of his paper for one issue. The manager of a local electric-light plant is said to have paid that sum for the silence of the paper on the gas question. The paper complied, but the editor appeared before the council and stated the money had been paid him for his silence. The court holds that he is entitled to keep the money.

The Great Northern Railway company is considering the feasibility of operating its trains through the Cascade tunnel in Washington by electricity. If it is concluded to use this power, the distance from Leavenworth, Wash., to Skykomish, Wash., 65 miles, will be so operated. Power would be obtained from the falls in Tumwater Canyon.

Perham, Minn., has just installed an electric-light plant, and finds that there are practically no wires strung for furnishing private houses with light. Additional wires will be stretched, covering the residence portion.

The city of Eau Claire, Wis., awarded the electric street lighting to the Eau Claire Light and Power company.

Another election will be held at Humboldt, Ia., to vote on a franchise for the Electric Lighting and Power company.

The Eighth street motor line in Dubuque, Ia., has been ordered sold in March by the United States court. The property involved exceeds \$100,000 in value. It is understood to be the intention of the present company to buy it in, as the remainder of the system would be useless without it.

The council of Missoula, Mont., has decided that the purchase of the electric-light and water plant by the city is too expensive, and the present company is furnishing service at reasonable figures.

The District Courts in Duluth and Superior have issued an order to permit street cars to be run over the Duluth-Superior bridge between the two cities. They have been doing so for some time, but this is an order to the assignee of the bridge company to continue the arrangement. M. S. P.

New England News.

Boston, January 16.—The Lynn and Boston Railroad company, which operates a surface line by electricity between Boston and Lynn, via Chelsea, asks for authority to increase its capital stock to the extent of 9,603 shares, and a hearing will be given by the railroad commissioners on the petition.

The Boston Elevated Railway company is fighting competition on the part of the West Roxbury and Newton road, which may eventually be extended toward the city proper and parallel the big concern's routes to Boston from that section.

The Tremont street tracks, which were removed when the subway was finished, have been greatly missed, and there are many petitions for their reinstatement. The matter will come before the Legislature, inasmuch as an order for their removal was attached to the original subway act, and it will require legislative sanction for their restoration. It is believed that Boston transportation facilities require the addition of the removed tracks already, so rapid is the growth of the business, to say nothing of the demands of the public for convenient car service.

The severed ends of the Anglo-American cable, which was broken off Cape Cod during the great gale last month, have been picked up by the cable steamer and reunited.

The first cars over the Norton and Mansfield electric road were run last month. This is interesting because the new line completes, with only one exception, the Bristol County system of electric lines centering in Norton, Mass. The Taunton, Mansfield and Attleboro lines are now in active operation, and the Mansfield and Easton line will be operated by spring.

A verdict of \$3,000 has been awarded against the Boston Gas Light company by Wolf Koplan, plaintiff, for injuries sustained by an explosion in the subway on March 4, 1897. This is the first of a long series of cases arising from the explosion, a test case, on which suits for \$1,000,000 have been entered. The gas company will take the case to the Supreme Court on exceptions.

The fortieth annual report of the railroad commissioners of the state of Maine shows that there has been an increase during the last year in the street-railway mileage of the state amounting to 2,572 miles. The number of passengers carried on the entire street-railway service was 14,651,161. Gross earnings for the year were \$862,885.64, and operating expenses \$613,396.42, making the net earnings nearly \$250,000. The most important extension of the year was between Lewiston and Bath, a distance of about 26 miles. J. S. B.

PERSONAL.

E. S. Lea, general manager of the Lea Manufacturing company, Elwood, Ind., was in Chicago this week.

E. Kuhlman, manager of the Kuhlman Electric

company, Elkhart, Ind., was a welcome visitor in Chicago electrical circles last week.

Mr. H. C. Eddy, well known to the electrical trade, is looking after the interests of the Buckeye and Jandus Electric companies in the territory under the jurisdiction of the Chicago office of these companies.

S. B. Way has resigned his position as construction engineer for the Electric Storage Battery company of Philadelphia to accept the position of chief electrician for the Imperial Heat and Light company of St. Louis, Mo.

Stanley A. Jones of Jones & Winter, St. Paul, was in Chicago early in the week. Mr. Jones is particularly interested in telephone construction work, and he says that independent companies are making great gains throughout the Northwest.

NEW INCORPORATIONS.

The Sangamon Electric company has been formed at Springfield, Ill., with capital stock of \$10,000, to manufacture electrical appliances and machinery, by Thomas F. Sheridan, Thomas B. McGregor and Frank G. Howser.

The South American General Electric Supply company of Schenectady, N. Y., has been formed for the purpose of buying in the United States and selling in South America electrical apparatus. The capital is fixed at \$50,000, and the directors are S. D. Greene, H. W. Darling, D. Mazenet, J. R. Lovejoy and M. F. Westover.

The Havana Electric Railway company, with \$7,000,000 capital, was incorporated at Trenton, N. J., January 7th. Its objects are to manufacture and sell electric power and sell gas in the West India islands, and to operate railways, cables, telephone and telegraph lines, light cities, towns and buildings, deal in real estate, engage in mining, smelting and refining, operate steamships and build and operate reservoirs and sewers. The principal offices of the company will be at Asbury Park, N. J., with Albert C. Twing as agent. The incorporators are W. P. S. Melvin of East Orange, G. K. B. Wade and Herbert A. Howell of New York. It is understood that the company is formed for the specific purpose of acquiring the street railways of the city of Havana.

ELECTRIC LIGHTING.

The need of an improved system of electric lights is being urged for Milton, Ore.

The village of Charlevoix, Mich., has purchased the Charlevoix electric-light plant, and will run it in connection with the water-works.

The Redwood City, Cal., Council has voted in favor of the proposition of submitting to the people the matter of raising funds for an incandescent-light plant. It was decided to raise \$8,000.

In Portland, Ore., the water committee of the City Council has resolved that the recommendation of the construction committee be adopted for the city of Portland owning and operating its own plant for the purpose of lighting the city. The construction committee was authorized to lay before the committee a form of contract for purchasing and installing a plant to light the city.

ELECTRIC RAILWAYS.

It is rumored that an electric line will be built from Grand Rapids to Kalamazoo, via Gull Lake, next spring.

An attempt is being made by an English company to secure a concession to build an electric wire-rope railway from Aosta, in Italy, over the Great St. Bernard to Martigny, in the Rhone Valley. The cost is estimated at \$2,895,000.

The Citizens' Street Railroad company of Indianapolis has filed with the Supreme Court a motion for a rehearing in the case in which it was recently decided that the company's charter would expire in January, 1901, and that the charter granted to the City Railway company would become operative on that date.

Work has begun on the inclined extension of the Lake Street elevated railroad of Chicago. The tracks will descend to the street level on an incline about half a mile long. Trains will be run out to Harlem and compete with the suburban service of the Chicago and Northwestern Railway company for the business of Oak Park and Austin.

The Westchester (N. Y.) Electric Railroad company has certified to the following proposed extension of its lines: In the village of Pelham Manor, on Pelhamdale avenue and Boston turnpike, from the old Boston post road to the New Rochelle boundary line; also along Pelhamdale avenue and the Shore road to the New Rochelle boundary line, and also along the Boston turnpike from Pelhamdale avenue to the New Rochelle boundary line.

A petition has been filed in court on behalf of the bondholders for the appointment of a receiver for the City Electric Railway company of Decatur, Ill. The receiver will probably be W. L. Shellbar-

ger, secretary and treasurer of the company. The holder of the trust deed is the National Trust and Savings Bank of Chicago. The capital stock of the company is \$300,000; bonded indebtedness, \$175,000; interest due since March 1st last, \$6,750. Falling off in earnings and assessments for street-paving improvements are among the causes assigned for the interest default.

A newspaper dispatch from Tacoma, Wash., states that John D. Rockefeller's agents at Everett, in that state, are preparing to build one of the largest electric plants on the Pacific coast. Its purpose will be to furnish power to operate the Everett and Monte Cristo railroad, 65 miles long, standard gauge, owned by Mr. Rockefeller, and chiefly carrying freight, together with the Everett street railway and half a dozen large Everett industries which Mr. Rockefeller controls. These include nail works, the largest paper mill on the coast, a smelter and the city lighting plant, besides a big concentrator at Mr. Rockefeller's Monte Cristo mines. It is estimated that the saving in the cost of power will pay for the electric plant in three years.

TELEGRAPH.

The Western Union Telegraph company is stringing a wire eastward from Los Angeles on the Southern Pacific. The workmen have reached Maricopa Junction, and will run a loop over the Maricopa and Phoenix railroad to Phoenix, Ariz., after which they will continue their way eastward.

The International Cable Directory company announces that the second edition of the "Western Union Telegraphic Code" will be issued on or about March 1st. This code differs from all others that have preceded it in the fact that it is on file in leading Western Union Telegraph offices and in hotels and other public places on both sides of the Atlantic, thus making it to all intents and purposes a universal code, while preserving all the conditions of secrecy required by users of codes. The book has been adopted by the United States War Department and by the commissioners to the Paris Exposition of 1900.

POWER TRANSMISSION.

The Portland Oregonian says that so great is the demand for cheaper power at Murray that a project has been considered of generating electricity at Thompson's Falls, Mont., and bringing it by wire as far as the big concentrators on the South Fork and Canyon Creek.

A report from Los Angeles explains that "although the drought of the last year has been disastrous to mining interests and will reduce the state's output of gold by many hundreds of thousands of dollars, a few of the big properties have been able to keep their production up to their usual amount. It has caused the increased development of water in many districts and has induced many mine owners to supplement water power with electricity, so that it has been of some benefit in leading to an increase in the means of production."

PUBLICATIONS.

A small pamphlet, issued by the Western Electric company, gives directions for the trimming and general care of that company's enclosed arc lamps. The booklet is of convenient size for the pocket.

The Western Electric company of Chicago and New York has recently issued bulletin No. 12, T. B. L., descriptive of a tile bolt and lock and also a screw bracket. The two devices are much in demand. A copy of this bulletin will be mailed to anyone upon application.

All the literary productions of the Joseph Dixon Crucible company of Jersey City, N. J., are well written and well printed; they have also an air of sincerity and the art of being interesting. One of the latest is a little four-page paper, Graphite, of which two numbers have appeared. It is frankly devoted to the interest of the Dixon company; there is no dissimulation about it, and it is worth reading. A recent pamphlet from the same source is entitled "Pencilings." It is well illustrated and describes the different kinds of Dixon lead-pencils.

A very handsome brochure, fully sustaining the reputation of the General Electric press, is that on "Thomson Recording Wattmeters," issued by the General Electric company of Schenectady, N. Y. Aside from a general introduction and an index, the pamphlet is divided into three parts—"Illustrations and Descriptions of Meters," "Complete List of Standard Meters," and "General Information Regarding Meters." The work shows evidence of careful compilation and should be valuable to engineers and managers. It will be sent on application to the company publishing it.

The twentieth annual number of The Tradesman of Chattanooga, Tenn., dated January 1st, is an especially valuable issue of this excellent periodical. The Tradesman devotes itself particularly to the development of the industries of the South, and the bulky annual is packed full of articles written by practical men and showing the industrial prog-

ress of that section of the country. Mr. A. S. Heywood of Atlanta contributes one on "The Progress of Electrical Development," indicating the electrical plants of the South installed or extended during the year 1898. In every way the Tradesman annual is creditable to its publishers.

A very convenient vest-pocket memorandum book, bound in celluloid, is issued by Baker & Co., the platinum refiners of Newark, N. J. The cover is adorned with a handsome representation, in colors, of a draped American flag. Under this design is the firm's card and a few words relating to the pamphlet, "Data Concerning Platinum." Otherwise, there is no advertising matter in the book.

The National Association of Manufacturers of Philadelphia has issued an American Trade Index, a descriptive and classified directory of manufacturers engaged in export trade, which has been published for foreign circulation. This directory comprises one feature of the practical work that is being done by the National Association of Manufacturers in the extension of foreign trade of the country. It contains an alphabetical list of members and a classified list, the registered cable addresses of members and particulars of cipher telegraphic codes. The association contains about 1,000 members, comprising the leading manufacturers of the country.

A graduates' magazine, The Technology Review, has just been issued by the recently organized association of class secretaries of the graduates of the Massachusetts Institute of Technology. It is an octavo volume of 140 pages, attractive in appearance and of the best workmanship. The cover, designed by Hapgood and printed on army brown paper, is handsome. The first number contains the announcement, a portrait and biographical sketch of President Crafts, articles on "The Function of the Laboratory," by Professor Silas W. Holman, and on the "Pierce Building," by Professor Eleazer R. Homer, the architect, reprints in fac-simile of early Institute documents and letters—all in the first and more general half. The latter half, seventy pages, is given to news of the Institute, of the undergraduates and graduate classes. Plans are shown of the several floors of the new Pierce building, of the first floor of the Rogers building as now altered, and of the dynamo house. There are two half-tone inserts and two line-drawings, one by Gelett Burgess. An excellent review of Professor Holman's recent book on "Matter, Energy, Force and Work" is given by Dr. Goodwin.

ELECTRICAL SECURITIES.

The Brooklyn City Railroad company has declared a quarterly dividend of 2½ per cent. and an extra dividend of one per cent.

The annual statement of the Chicago General Railway company shows receipts from passengers of \$17,294, and from miscellaneous sources of \$2,444.95, making a total of \$19,738.95. The expenditures were for maintenance \$11,732.73, transportation \$39,763.33, general expenses \$8,076.67, fixed charges \$55,202.01, total \$114,774.74; leaving a net gain of \$4,964.21.

The North Shore Traction company reports gross earnings for November of \$103,488, a decrease of \$1,994 as compared with the same month of the previous year, and net \$30,658, a decrease of \$6,231. For the two months ended November 30th the gross earnings were \$227,534, a decrease of \$232 as compared with the corresponding period of the previous year, and net \$84,654, a decrease of \$2,630.

The directors of the General Electric company have declared the first dividend of \$3.20 on the preferred stock of the company as reduced. They have also declared a dividend of \$11.66 2-3, applicable to the unpaid accumulated dividends on the preferred stock. The unpaid balance of \$19.05 2-3 will probably be paid, it is said, within a short time, and then consideration will be given to the payment of dividends on the reduced common stock.

Plans of reorganization of the New Orleans Traction company are under advisement now by a committee representing the interests involved. Holders of Crescent City Railroad company's five per cent. construction bonds, Crescent City Railroad company's stock, New Orleans City and Lake Railroad company's stock, New Orleans Traction company six per cent. construction trust notes, preferred stock and common stock have been invited to deposit their holdings with the Continental Trust company of the city of New York, Fidelity Trust and Safety Vault company, Louisville, Ky., or United States Trust and Savings Bank, New Orleans, La. Thirty-three and one-third per cent. of the amount payable on New Orleans Traction company's preferred and common stock, namely, \$2 per share on the preferred stock and \$1 per share on the common, is payable at the time of the deposit of securities.

MISCELLANEOUS.

Mr. McGann, commissioner of public works in the city of Chicago, has started on a campaign of

progress, he says, in the way of preparing the streets of Chicago for automobile vehicles, which will carry 10 or 12 tons of freight, and which, he believes, will be used by most firms doing a large hauling business as soon as the streets are strong enough for the traffic.

Sofia and Constantinople, in part, have been supplied with electric lighting by German firms, who have also installed the electric light for the municipality of Kalamata in Greece, where Heidenmann & Co. of Cologne have constructed an electric railway to the harbor of Kallivra. In Roumania there has been established a branch of a large German firm. The electric lighting of the palace of the sultan at Yildiz has just been carried out by a Berlin firm, who gave Magdeburg and Buckau firm the contract for the necessary machinery.

TRADE NEWS.

A serviceable monthly calendar for 1899 is issued by the Phillips Insulated Wire company of Pawtucket, R. I. A feature is a sheet at the back containing complete calendars for 1899 and 1900.

In officially announcing the death of Mr. R. T. McDonald, the Fort Wayne Electric corporation says: "While his death will be keenly felt by all his business friends and associates, it will not materially affect the business affairs of this corporation, except that it will necessitate the election of a new president. This election will occur in due course of time, and when made will be announced to all persons interested."

Mr. Stuart W. Wise, who was formerly treasurer of the Manhattan General Construction company, has opened an office in the John Hancock building, 178 Devonshire street, Boston, Mass., the former New England address of the Manhattan company. Mr. Wise will push the sale of the Manhattan enclosed arc lamps. The company manufactures lamps for direct-current circuits to operate singly on 110 to 220 volts, two or more in series on 220 to 550 volts, and to operate singly or in series on alternating-current circuits.

General Manager Corrigan of the American Electric Vehicle company, Chicago, receives from time to time gratifying testimonials of the efficiency of his vehicles and of the pleasure they give the users. One purchaser, E. W. Young of Oconomowoc, Wis., in a letter full of enthusiasm on the merits of the American vehicle, says: "For comfort and ease of riding nothing could be nearer perfection. In speed it exceeds your claim for it. A child can guide it, as mine has done. It is clean, odorless, absolutely harmless, and will not shy at a stump or bicycle, gets no bad tempers, requires no coachman. Suffice it to say that I have found the ideal sport, and that your carriage is the ideal way to secure the most pleasure from this sport, and I wish you every success."

Mr. George B. Foster has been appointed sales agent in charge of the branch office of the Wagner Electrical Manufacturing company in Chicago. The Wagner company recently located in handsome offices in the Marquette building, Chicago, and Mr. Foster will look after the company's interests in Northern Illinois and Northern Indiana, Michigan, Wisconsin, Minnesota and in Iowa. Mr. Foster is a thoroughly reliable, experienced and capable electrical man. In 1887 he was salesman for the Western Edison company; he was afterward with Humbird & Gorton and then with Leonard & Izard and the Thomson-Houston company. During the World's Fair he was engineer in charge of arc lighting at the fair grounds. Of late he has been identified with the Chicago office of the Walker company. With a man as well known and as experienced as Mr. Foster in charge of this important branch, it is safe to say that the Wagner company will find its interests well taken care of.

BUSINESS.

The Globe Carbon company of Ravenna, O., issues a hanger with an amusing picture of "The Real Carbon Battery" as a centerpiece. The Globe company's battery is said to be "first in quality, first in efficiency, first in the hearts of our countrymen."

The Buckeye Electric company finds its factory severely tested in keeping even with the orders received for the Buckeye special coiled-filament lamp. This company ships only selected and thoroughly tested lamps, guaranteed uniform in wattage, voltage and candle power. The special filament used in lamps for alternating systems is highly commended by central-station managers.

The Chase Electric Sign company of Chicago has opened an office at 26 South Eleventh street, St. Louis. This company is meeting the success which it merits, doing an honorable and straightforward business in a business-like way. It has recently placed in position an exceptionally large electric sign (11 by 33 feet) with three lines of lettering over the entrance of the St. Louis Exposition building.

The Jandus Electric company reports an excellent demand for the Jandus enclosed arc lamps for all

systems. The continuous-globe lamp, 25 inches in length, meets the demand for a short lamp, and has, it is claimed, the advantage of perfect ventilation, thus preventing overheating and depreciation of efficiency. Catalogues and information may be had by addressing the Chicago office, 753 Monadnock building.

The G. F. Harvey company of Saratoga Springs, N. Y., issues a booklet giving the favorable opinions of a large number of physicians who use Vitogen in practice. Vitogen is an antiseptic powder recommended to electrical men in the treatment of burns. The Harvey company exhibits a letter from Harry E. Rood of the Gas Light and Coke company of New Albany, Ind., who says that Vitogen saved his life. Mr. Rood was severely burned in the back by contact with an arc-light switchboard.

The Central Electric company, Chicago, is sending out a neat piece of advertising matter in the shape of a circular card about a foot in diameter, one-half section of which is devoted to an embossed Okonite trademark and the other half to artistically arranged samples of Okonite wire. The Central Electric company has adorned its various advertisements with a new and tasteful trademark, embodying the names of the Central Electric company encircling the well-known Okonite design.

These two names have been so long associated together that it seems eminently fitting that their combination should be made emblematic.

A very simple device is often of more value to the users and the originator than a more complicated piece of apparatus. The Ritter soldering-iron attachment is an example of the value of a simple device. As the name partly indicates, this is a small soldering-iron tip designed to be attached to the burner of an ordinary gasoline blow-torch. The tip may be attached or removed instantly with an ordinary screwdriver, and is capable of doing all the work of an ordinary soldering iron. It has the advantage of being light and convenient to carry around and of being always hot and ready for use as long as the torch is burning. The Electric Appliance company is introducing this specialty, and states that it has no difficulty in selling one or more to every construction man to whom it is shown.

The Western Electrical Supply company of St. Louis, Mo., is exploiting its Perfection annunciator, which has met with much favor from the electrical trade in general. The mechanism of the Perfection annunciator is of such a character that it will, it is said, stand any jar without dropping the needle, and at the same time it is very sensitive to the battery current and requires a very small amount

of battery to successfully operate it. In appearance it is of neat and artistic design, with a finish that is a credit to the maker. The Western Electrical Supply company is making popular prices on these annunciators, with the desire to furnish the trade with a strictly high-grade instrument at a reasonable price. These annunciators are fully illustrated in the company's new No. 18 catalogue, which will be mailed to anyone in the trade upon request.

J. Holt Gates & Co., Marquette building, Chicago, report the following recent sales: Armour Glue Works, Chicago, one 225-kilowatt, 500-volt generator, two 150-kilowatt, 500-volt generators, seven 50 horse power motors, two 100 horse power motors, two 150 horse power motors, one 30 horse power motor, all made by the Card Electric company, Mansfield, O.; Deering Harvester company, Chicago, seven 500-light transformers, five 400-light transformers, three 200-light transformers; Elkhart Lake Electric Light company, Elkhart Lake, Wis., two 10 horse power single-phase motors and transformers, and direct-current dynamos attached to large storage batteries for electric launches; Armour Glue Works, Chicago, one \$3,000 switchboard; Pierce & Robinson, Chicago, one \$700 switchboard; residence of P. D. Armour, Jr., Chicago, one 300-light electric-light plant, with Nash gas engine direct-connected.

ILLUSTRATED ELECTRICAL PATENT RECORD.

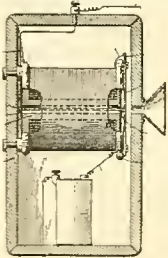
Issued January 10, 1899.

617,314. Telephone. Will E. Byrns, Adams, Ind. Application filed May 27, 1897.

This is a magneto-telephone and comprises a hollow core, a metallic diaphragm secured opposite one of the heads thereof, a metallic bar constituting a conductor secured at one end to the diaphragm and adjustably secured at its other end to a stationary part, whereby the tension of the diaphragm may be positively controlled, a helix upon the core in electrical connection with the battery or generator and the diaphragm, and connections between the conductor and the line wire.

617,325. Railway Signal System. Frederick C. Esmond, New York, N. Y. Application filed March 17, 1896.

A signal apparatus is adapted to be set and locked by a passing train to signal an approaching train, a register for the approaching train and operating apparatus for the register being placed at a point succeeding that at which the signal is received and adapted in like manner to be set by a passing train simultaneously with the signal apparatus.



NO. 617,314.

617,375. Electrical Resistance. Julius F. H. Voigt and Jacob A. Haefner, Bockenheim, Germany. Application filed December 26, 1895.

An electrical resistance consisting of a suitable base piece, an enamel layer secured thereto and a conducting layer of fired liquid metal.

617,381. Electric Transformer. David H. Wilson, Chicago, Ill. Application filed July 30, 1897.

The coiled conductor having a metallic core is provided with opposed pole pieces; a second coiled conductor is provided with a metallic core, the second conductor and core permanently mounted between the pole pieces of the core of the first conductor so as to at all times form part of the magnetic circuit of the first-mentioned conductor, one of the conductors acting as a primary coil, the other acting as a secondary coil.

617,382. Telephone System. David H. Wilson, Chicago, Ill. Application filed July 30, 1897.

The induction coil is provided with a movable core, a circuit breaker associated therewith and operated by the movement of the core, a receiver, a transmitter, a signaling device, a system of circuits so arranged that the circuit breaker is in circuit with the primary coil when the signaling device is operated and is cut out of circuit when the transmitter is being used.

617,418. Electrical Measuring Instrument. George T. Hanchett and Frederick B. Sage, Hackensack, N. J. Application filed May 2, 1898.

In a Wheatstone bridge, the combination of the circuits thereof, a circuit closer for the battery and a circuit closer for the bridge, both attached to a single movable handle.

617,422. Telephone. Theodore Berdell, Summit, N. J. Application filed March 28, 1896.

An outer diaphragm is held at its center by a conducting support, an inner diaphragm or plate is mounted upon an insulating bridge, through which the conducting support passes, and an amount of granular material is held between the diaphragms.

617,503. Circuit Breaker. Paul P. Goldey, Philadelphia, Pa. Application filed March 2, 1898.

In a circuit breaker the combination with the line terminals of a pivoted switch arm carrying terminals, and a magnet arranged to the arm and mounted in the connection between the terminals, a catch to hold the switch in its open position to engage the terminals and a spring to throw the same down on release of the catch, and an armature arranged in connection with the magnet and catch as described and so as to release the catch on the occurrence of an abnormal current in the line.

617,526. Apparatus for Electrodeposition of Metals. Elisha Emerson, Buffalo, N. Y. Application filed December 16, 1896.

In an apparatus for the electrodeposition of copper there is the combination with a cylindrical cathode of a series of horizontal anode bars in proximity thereto, and curved supports therefor composed of lead with lugs or ribs forming receptacles for the anode bars, whereby the latter are maintained out of contact with each other and in the same relative positions as they are dissolved.

617,540. Electric Signal. Charles A. Parrish, Jackson, Mich. Application filed August 4, 1897.

In electrical signal apparatus there is the combination with the track instruments, a relay, a circuit therefor, and a circuit through the track instruments and the relay magnet, which circuit has therein a pair of insulated terminals adapted to be closed by the relay, of a signal circuit including the signal and a source of electric energy and having for its terminals the relay circuit-closing lever and one of the insulated terminals, whereby the closing of the open terminals by the circuit-closing lever simultaneously completes the two separate circuits.

617,543. Electrotherapeutic and Massage Apparatus. Oscar Schneider, New York, N. Y. Application filed August 17, 1898.

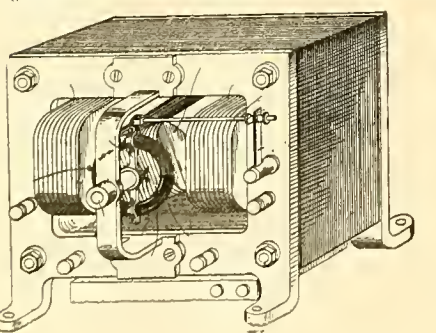
A roller electrode is provided with an interior compartment and is composed of wooden sections, intermediate metallic strips and metallic heads with which the strips are alternately connected, and a spring-actuated nipple guided in a suitable socket in the roller electrode and adapted to eject liquid charged in the same, is also provided.

617,546. Controlling Electric Motors and Trains. Elihu Thomson, Swampscott, Mass. Application filed February 28, 1898.

Provision is made for separately actuated contacts for varying the motor speed, electromagnets for controlling the contacts and means for controlling the magnets from a distance.

617,508. Automatic Regulator. George S. Neeley, Pacific, Mo. Application filed July 28, 1897.

Claim is made for the combination with an induction motor included in the primary circuit of a dynamo, and an auxiliary exciting generator for the dynamo, of a column or post upon which the induction motor is mounted, a carrier rigidly connected to the rotary member of the induction motor, a governor sleeve slidably fitted on the column or post, governor arm pivoted to the carrier and linked to the sleeve, and a crank linked to the governor sleeve and to the brush carrier of the auxiliary exciting generator.



NO. 617,381.

617,601. System of Control for Electric Motors and Railway Trains. William B. Potter, Schenectady, N. Y. Application filed March 17, 1898.

A system of train control for an electric railway is described comprising a number of motor cars, each of which is provided with a controller for its motor, the controllers being in parallel between the source of supply and ground, step-by-step actuating devices for each controller, a circuit or circuits including the step-by-step actuators, and a regulator in the circuit or circuits governing the actuators.

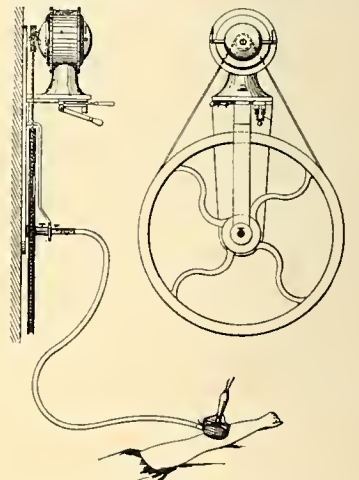
617,608. Electrical Cut-out. Albert P. Seymour, Syracuse, N. Y. Application filed November 1, 1897.

A fuse box is provided with a chamber having interior longitudinal radially projecting faces, a rotatable live-current plug, provided with exterior longitudinal radially pro-

jecting faces, adapted to contact with the radially projecting faces of the chamber, whereby the chamber is divided into two separate chambers, metallic terminals on the fuse box, and contact plates on the plug for engaging the terminals.

617,621. Electric Headlight Lamp. Harlan P. Wellman, Ashland, Ky. Application filed September 15, 1898.

An electric headlight lamp having positive and negative carbons, an inclosure for the carbons, means to which the inclosure is secured for adjusting the carbons, and means for axially rotating the inclosure, whereby the carbons may be relatively adjusted.



NO. 617,543.

617,664. Automatic Alarm Mechanism for Electric Motors. Robert W. Traylor, Richmond, Va. Application filed June 22, 1898.

An automatic alarm mechanism for electric motors and other apparatus comprises a normally open electric circuit, which includes one or more signaling or alarm devices, a rotating cylindrical body, a friction gear arranged in suitable relation to the cylindrical body so as to be operated by frictional contact with the latter, due to downward displacement of the body, and a circuit-closing device having an operating connection with the friction gear to close the normally open circuit and operate the signal or signals.

617,691. Telephone Switchboard. James M. Overshiner, Elwood, Ind. Application filed August 4, 1896.

A telephone switchboard is described comprising a series of combined drop devices and jacks, each comprising in a single structure a magnet, a drop, a latch device for the drop, a rocking jack having a socket in its end for the reception of a plug and contact pins co-operating with the jack.

617,692. Telephone Switchboard. James M. Overshiner, Elwood, Ind. Application filed April 10, 1897.

A cam or enlargement on the drop is adapted to overhang the socket of the jack when the drop falls, and a plug having an independently movable handle is adapted to engage the cam or enlargement on the drop and restore the latter to the latch device.

617,702. Annunciator-drop Device. William O. Meissner, Chicago, Ill. Application filed July 1, 1896.

An annunciator drop is described comprising an electromagnet, a case therefor stamped from a continuous piece of metal, and comprising a body portion provided with wings and adapted when bent into shape to surround the sides and bottom of the magnet, a lug projecting from each side of the body portion near its end and integral therewith, a projecting part at the other end of the body portion integral therewith and adapted when bent into shape to be connected with the core of the magnet and cover the end of the magnet, an armature pivoted to the lugs on the body portion, a drop located at one end of the magnet, and a hook connected with the armature extending past the magnet so as to engage the drop.

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EVERY SATURDAY.

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No. 4

Henry L. Doherty.

At Milwaukee last week the Northwestern Electrical association, now having the largest membership of any electrical association in the country, elected a man not 29 years old to be its president. Mr. Henry L. Doherty of Madison, Wis., who was thus honored, is the youngest man ever elected to the office he now holds, and it may be doubted whether so young a man holds the presidency of any similar organization in the country. However, although young in years, Mr. Doherty has had a wide experience in the lighting business. His has been no accidental advancement. He has worked for it and earned it. Mr. Doherty is a man of much energy, good capacity and quick resource, of whole-souled devotion to the interests in his charge and of entire loyalty to his associates. While no doubt ambitious for himself, he is also cordially interested in the success of others. He is a good man to arouse the esprit de corps of any body of men associated by mutual interest. He has the enthusiasm of youth, and he is self-confident and persevering. Fortunately, too, he is gifted with pleasing and persuasive manners. It is this combination of character-traits that made Mr. Doherty's rise in the Northwestern Electrical association so rapid.

Henry L. Doherty was born on May 15, 1870, and was reared in Columbus, O. He had his own way to make in the world, and at the early age of 10 he became partially self-supporting, earning money to buy his clothes by carrying papers. When Henry was 12 years old he entered the service of the Columbus Gas company. Mr. Emerson McMillin was then superintendent of the works, afterward becoming general manager and then president. Since that time Mr. Doherty has been (with one or two short exceptions) continuously associated with Mr. McMillin in various capacities, from office boy to manager in various gas and electric plants controlled by Mr. McMillin.

In the spring of 1896 Mr. Doherty moved to Madison on account of his health and became general manager of the Madison Gas and Electric company. The plant was threatened with municipal opposition, which he successfully averted. His determined opposition to municipal ownership, at all times and places, has brought him into prominence and has shown him to be an active and effective worker.

Mr. Doherty is a prominent member of all of the large gas associations, and has been a frequent contributor to gas literature and an inventor of many gas appliances. He gave the first public lecture and exhibition ever given in the United States of calcium carbide and acetylene gas, and the five or six years that have intervened have failed to disprove the statements and predictions he then made.

The new president of the Northwestern association has educated himself in chemistry and gas, steam and electrical engineering. He indulges sparingly in light reading, but confines his studies entirely to scientific matters relating to gas and electrical engineering. He is a member of eight engineering and scientific societies. Though still the manager of the Madison Gas and Electric company, he has given this property but a portion of his thought for the last two years, and at present is acting as Mr. McMillin's assistant in his position as president of various large gas and electric companies. He spends the greater portion of his time in New York, but still claims Madison, Wis., as his home.

Mr. Doherty's wide acquaintance with electric, gas and other engineers, coupled with his energy and ability, of which he has given ample proof, should prove advantageous to the association. He hopes to interest capital, to a greater extent than has been done, in central-station work generally throughout the country, and thus assist in the extension and development of the electric-lighting industry.

Mr. Doherty is unmarried.

Agents are engaged in making surveys and securing the right-of-way for a projected trolley line across New Jersey from Trenton to Point Pleasant. They say they have perfected arrangements between Point Pleasant and Hamilton Square, the latter a village four miles east of Trenton. New York capitalists are said to be behind this project.

Overhead Trolley to Be Substituted for Cable in Chicago.

The Chicago street-railway companies have been anxious for several years to substitute the overhead trolley for the cable wherever the latter is used, but thus far they have been unable to obtain ordinances granting permission to make the change. The City Council is now considering a proposition of this character, and it is believed in street-railway circles that permission will be granted.

Charles T. Yerkes argued for the universal overhead trolley at a special meeting of the joint street committee of the council on Monday afternoon, and it is admitted that there was evidence at the meeting and afterward that some aldermen who upheld Mayor Harrison in his fight against the franchise-extension ordinances were inclined to favor the overhead trolley in the heart of the city. Aldermen Badenoch and Gunther talked openly in favor of the Chicago City Railway company's ordinance for a trolley loop in Michigan and Wabash avenues and State street. These aldermen and others say they

put on more cars that can safely be accommodated and that breakdowns may be expected at any time as a result. The tunnels are necessary for the operation of cable lines, and their capacity is limited, but trolley cars could be carried over the bridges on trolley lines as well as through the tunnels, and this, of course, would relieve the present congestion of traffic. If Clark street and Lincoln avenue cars could be carried over the Clark street bridge, the service could be greatly improved, as it would admit putting on 50 per cent. more cars.

On the South Side the same complaint has been made, and the management has contended that it was helpless as long as the council refused to permit it to use electricity on its State street and Wabash avenue lines. While the track elevation work was in progress and the Indiana avenue cars were operated electrically over Wabash avenue north of Eighteenth street, instead of being carried down as trailers on the cable line, the service was so much improved that the patrons of that line have ever since been clamoring for extension of the trolley system so as to do away with the cable. Aldermen Gunther and Badenoch voiced this sentiment in demanding the change.

An officer of the Chicago City Railway company pointed out that the conditions in New York were entirely different from those that obtain in this city. New York has good drainage, well-paved streets and the roadways are kept cleaned. An entirely different state of affairs exists in Chicago. The drainage is very poor—the worst in the country, it is claimed—and, taken in connection with poorly paved and exceedingly dirty streets, would make the operations of a conduit trolley line impracticable. State street, for instance, during the spring is frequently submerged at several points, and the cable slot admits the water and mud to the conduit. With these conditions it is not strange that the management refuses to consider the substitution of electric conduit for cable service.

"If the city provided properly drained streets and kept them paved and cleaned we might find means of complying with this demand," said an officer of the South Side company, "but to-day it is simply out of the question."

Death of a Telegraph Pioneer.

[From the Boston correspondent of the WESTERN ELECTRICIAN.]

Captain Charles Spear of Hingham, Mass., died January 21st at his home in that town, aged 81 years. He was one of the leading business men of Boston a quarter of a century ago. He went to California in 1850 and built up a steamboat business there which profited by the mining boom. On his return to Boston he built and was the sole owner of the telegraph line from Boston to Albany. He also built the Cape Cod telegraph line to Boston.

in connection with which he established the Cape weather report, which has since come to be looked upon at the port of Boston as one of the public necessities. These reports were telegraphed from Highland Light to Boston, and were displayed in the Merchants' Exchange news room on State street of which concern Captain Spear was then the proprietor. He had also been interested in many large transportation enterprises. He was a prominent Mason and Odd Fellow.

American Engineering Exhibits at Paris.

At the annual meeting of the American Society of Civil Engineers in New York last week Mr. William E. Smith of Chicago, who has been appointed commissioner to supervise the engineering exhibit from this country at the Paris Exposition, urged the society to help make this country's showing a creditable one. Already 13,000 square feet have been allotted for the exhibition, and more will be available in the United States government building. Mr. Smith urged the engineers to provide models of American cities, showing their situation, railroads, highways and waterways. The transportation charges will be paid by the United States commission. Mr. Smith asked the society to do its utmost to bring the engineering feats of Americans to the attention of the people of Europe, and said that President McKinley was especially anxious that the United States should be well represented at the exposition.



HENRY L. DOHERTY.

will vote for the Yerkes universal trolley ordinance if a clause is inserted fixing a time when some other system will be substituted.

Mr. Yerkes had said that if any reputable firm in the United States would contract with his companies to put in an underground electric conduit and operate the system successfully for one year the companies would take the plant off the hands of the firm, pay the cost of installation and 10 per cent. profit on the investment. He also promised to "take down the trolley and throw it away" whenever any practical substitute was on the market. Arguments were made by Aldermen Math and Herrmann against extending the overhead trolley when the underground trolley was in successful operation in New York, Washington and Budapest. Mr. Yerkes told the aldermen about the Love traction experiment with the electric conduit on his North Side tracks. It was all right in dry weather, he said, but the bad weather came and knocked out the insulation. Since then he had lost faith in the underground trolley and had never changed his mind. "It is all in the lay of the land," he said, referring to the obstacles in Chicago.

At present there is a general demand for increased surface-railway facilities on all sides of the city, particularly in the West and North Divisions. Mr. Yerkes has pointed out that the present cable plant is taxed to its full capacity and that the lines thus operated are constantly overcrowded. He claims that at certain hours the company is now forced to

MILWAUKEE CONVENTION.

Annual Meeting of the Northwestern Electrical Association Last Week.

The seventh annual convention of the Northwestern Electrical Association was held in the Hotel Pfister, Milwaukee, on Wednesday, Thursday and Friday of last week. President F. A. Copeland of La Crosse, Wis., presided. There was a large attendance and much interest. Considerable important business was transacted, one item being the abolition of the summer meeting for 1899.

OPENING BUSINESS.

After the routine opening business Secretary T. R. Mercein presented his report as secretary and treasurer, which was adopted, Mr. Norcross referring to Mr. Mercein's reports as always "good, specific, full and satisfactory." The secretary announced that the association had now the largest membership of any electrical association in the country, and the statement was received with applause. He also called attention to the various features of the programme.

At the afternoon session the members listened to the reading of the

PRESIDENT'S ADDRESS.

Six years ago a few Wisconsin electrical men met together and organized the "Northwestern Electrical Association," calling their meeting its first annual convention and themselves its charter members.

There was no flourish of trumpets; little or no public notice was taken of the matter and no general interest was manifested in it.

To-day, at its seventh annual convention, the "Northwestern" is the largest electrical association in the country, and its members gather together from Ohio on the east to Colorado on the west, and from Arkansas on the south to Manitoba on the north. The press heralds its conventions months before their dates; full copies of all its convention proceedings, papers and discussions are subscribed for in advance by the leading electrical journals, whose representatives—frequently the editors themselves—are always in attendance at its meetings. Its convention reports have been sent, on request, to public and private technical libraries in this country, and to foreign lands. These and other gratifying facts should be, as doubtless they are, a source of pride to every member, and should stimulate each of us to do his share in promoting the welfare and extending and strengthening the influence and power of this sturdy and vigorous young association, which in the limited field of its own choosing has, in six short years, moved from the foot to the head of its class. The inquiring mind naturally seeks the causes that have operated to this success. I think it is due to the following, among others:

First—The fact that the association has been, and is, conducted on broad lines, aiming for the greatest good of the greatest number; to benefit the men at the coal pile, the boiler, the engine, the dynamo, the switchboard and the lamp, as well as the owner and the manager; that it aims to come, and does come, in close touch with the practical men and the practical questions in the everyday operations of all parts of a working plant.

Second—The fact that the large majority of our members are men of the Northwest, a virile, active, self-reliant, assertive manhood, eager and willing to learn and no less eager and willing to teach. No better life-blood can be asked for in any active organization than to have its membership largely of men of the great Northwest.

Third—The fact of its economy, it costing but \$5 to join, and \$5 a year to retain full membership—the lowest cost of any association in the country.

Fourth—The happy combination of business and pleasure that marks our official programmes, attracting men to the meetings and membership because they know, either from the programmes sent them or from their previous experiences with us, or from those of others, that they are coming to meet old friends and make new ones; that they will learn something themselves, or teach something to others, all in an atmosphere of welcome, goodwill and good-fellowship that brings out the best side of their natures and remains a pleasant memory when they return to their homes and their daily routine.

These facts, with others, gentlemen, have made our association what it is to-day.

There are several matters of more or less importance to which I call your attention. One of them is the question of summer meetings. As you know, our articles of incorporation provide for two meetings a year, on the third Wednesday of January and July respectively.

It has been suggested that the interests of the association would be best subserved by having but one meeting a year, the main reason advanced therefor being that the summer meetings are but sparsely attended by central-station members; they are therefore of little value. If the matter comes up I trust it will be fully discussed and acted upon with due deliberation. In this connection I will call your attention to the fact that while associate members have, under our present rules, no vote on this or other questions, they are a large, liberal and important element in our membership, and their wishes and interests should have due weight in the consideration of any radical change of association plans.

Another question is whether we should not adopt some systematic plan of compiling and issuing to members published articles of interest to our members, such as articles on municipal ownership, be they in favor of corporations or municipalities, the reports of cities operating their own plants, or any other matter that would be of benefit to members of this association.

I would suggest that a committee, consisting of the secretary and two members, be appointed to collect data, etc., that in its judgment would be of value to the members, have it compiled in suitable shape for filing, and copies sent to each member.

To assist this committee, I would suggest that each member, on seeing an article on any subject he thinks of interest, cut it out and mail it to the secretary. We could in time form a valuable pamphlet for ready reference.

Another suggestion is that we have a representative at each state capital in our territory, either a member of the association or someone in our employment, to examine all bills introduced in the legislatures, and report promptly on those that in any way affect electrical interests. His report could be made directly to the chairman of the legislative committee, and could then decide the action necessary.

Our association has grown to be quite a factor in the electrical world, and in order to command the respect that is due us it has become necessary to increase the work in the secretary's office. There are few of you who realize the amount of time and labor required to run this office. Similar institutions pay their secretaries a salary. It is not nec-

and Lord. Later Mr. Schuette's resolution, amending the by-laws to provide for an assessment on all central-station members in Wisconsin, was referred to the same committee.

This resolution of Mr. Schuette was an important one and was the cause of much discussion. It read as follows:

Resolved, That Article II. of the by-laws of this association be amended by adding a new section, as follows:

Section 3. Whenever the officers of this association may deem it necessary to raise funds, for the purpose of protecting the material interest of our central-station owners, they are hereby authorized and directed to levy an assessment on all central-station members in Wisconsin, in an amount not to exceed ten cents for each kilowatt of dynamo capacity of their plants in any one year.

Mr. Schuette also suggested that all central stations not members (perhaps one-third of the whole number in the state) should be requested to contribute to this fund, the same as the members, as they would derive the same benefit. He explained that it was proposed to pass a law in Wisconsin that even if any city had reached the debt limit of five per cent. valuation, if it wishes to engage in electric lighting, it need not consider that as indebtedness at all; so that, if the law is passed, any city may go into the business at once. "Supposing this bill is passed," said Mr. Schuette, "the cities which would have built before, perhaps, except on account of the limitation, can build at once, and some electric-light man will go to a city and say, 'Look here; you build a plant (I can build a plant for you for one-half what the existing plant will cost), and I will take bonds on the plant for half the pay.' We should make an assessment, and it is very important that it should be done. There must be some



VICTOR TELEPHONE EXHIBIT AT MILWAUKEE.

essary to state the exorbitant salary ours receives. I would suggest you take this matter up and adjust the salary to something compensate for the labor involved.

I would also suggest that the dues of members be raised to \$10 a year, as the present dues are not adequate for running the association on the lines on which it should be run. The dues of the National Electric Light association are \$25; those of the Edison association \$106.50; and I am sure our association is of as much value to its members.

I commend these questions to your consideration. Association matters have gone so smoothly since we last met that there seems nothing to criticize, unless it would be the steamer convention of last June, which should be judged more as an excursion than as a convention. Those who were able to go enjoyed a delightful trip, admirably arranged and carried out.

I would suggest that officers be elected at the end of the convention.

In closing, I call your attention to the programme for this meeting. It is an interesting and attractive one, and we should all get pleasure and profit from it. It is from discussions, however, that most benefit results, much being brought out in them that the mere reading of a paper does not give. We are here to learn from each other, and no discussion confined to the points of a paper will be abridged unless absolutely necessary.

I wish you all a happy and prosperous new year.

GENERAL BUSINESS.

On motion of Mr. Doherty the suggestions in the president's address were referred to a special committee. On Mr. Debell's suggestion this committee was also instructed to nominate candidates for the various offices. The members of the committee were Messrs. Norcross, Debell, Livermore, Kountz

one at Madison continually during the session. I have no doubt there will be a dozen different bills introduced this year."

The question of the interests of other states than Wisconsin in the territory covered by the association came up in the discussion of this resolution. Mr. Livermore said that the Minnesota Electric Lighting and Gas association was formed last summer for the protection of its own members. He thought that purely state matters should be left to state associations. Others thought that members in the different states should co-operate. Mr. Schuette wanted some one employed to represent the Northwestern association at Madison during the session of the Wisconsin Legislature in any event. Finally, the whole subject was referred to the committee already appointed.

On Thursday morning the report of this committee was received. It contained several important recommendations. For

NEW OFFICERS

these gentlemen were named:

President—Henry L. Doherty, Madison, Wis.

First vice-president—John H. Harding, La Porte, Ind.

Second vice-president—S. B. Livermore, Winona, Minn.

Secretary and treasurer—Thomas R. Mercein, Milwaukee, Wis.

Directors—W. W. Bean, St. Joseph, Mich.; J. H. Culver, Decatur, Ill.; George Innes, Eagle Grove, Iowa.

These officers were duly elected:

SOME IMPORTANT CHANGES.

On the recommendation of the committee the salary of the secretary and treasurer was raised from

\$150 to \$300 per annum, beginning with this fiscal year.

It was decided to hold no summer meeting in 1899.

In accordance with President Copeland's suggestion, there was created an information committee, composed of the secretary and two other members—P. H. Korst of Racine, Wis., and E. L. Debell of Sheboygan, Wis.

Later in the day Mr. Lord explained that the new information committee was instituted for the purpose of taking charge of matters of general information for the association. "When any member," said Mr. Lord, "finds anything pertaining to electric lighting or municipal ownership, for instance, or anything of that nature, he is respectfully invited to forward it to the secretary of the association, and then the secretary, in connection with the other members of the committee, will prepare the matter and publish such parts of it as are necessary and desirable, and, as I understand it, send these printed slips out to the different members of the association for their future benefit and use."

Mr. Norcross thought that the plan was one of the simplest, cheapest and best ways that could be had of each man in the association getting the benefit of the news and suggestions of every other man. Whenever anyone finds a useful article in a magazine, or gets hold of any important information let him forward it to the secretary. As an example of the kind of information that was wanted, Mr. Norcross said that he had been inquiring into the question of the kind of coal that it was best to use. Suggestions from experience would be valuable to him and doubtless to others.

The matter of representation at state capitals within the jurisdiction of the association during the sessions of the respective legislatures was left

certain qualifications for membership in the association, and at the time that the member is elected those qualifications may be all right, but they may not be maintained. Those qualifications might be changed, and if it is worth while to provide qualifications in advance, it would seem to me wise that we should maintain some way of keeping up our classification. Another point is the fact that we have an honorary membership list which is rather large for an association of our years. It does contain many excellent names, such, for instance, as that of Professor D. C. Jackson, a man whom this association cannot honor too much, but it seems to me that we ought to have some way of cutting down that membership, and I see no other way except to reclassify all of those members in the associate and active membership. This is a matter that I hope will be taken up. A number of those on our list of members do not take interest enough in the association to attend its meetings, and I think the whole membership ought to be reclassified, and then we might elect those we saw fit to that membership.

"Another change I suggest in our by-laws is that honorary members be nominated at least six months prior to the election. At one or two of our summer conventions there have been honorary members elected when there was only a very small attendance of the active members of the association, and I do not think any harm could arise from a nomination at least six months prior to election, and I therefore suggest that change.

"Another change is that the election of officers be made the closing order of business.

"There are one or two other suggestions that I would like to offer. One thing is in regard to our badge. The present badge is seldom seen except at a convention, and I suppose in this room there are a great many of the National Electric Light

Another Niagara Power Project.

By ORRIN E. DUNLAP.

There is a prospective new power development scheme at Niagara, and if the project is carried to completion it will result in a development of power close to the Whirlpool Rapids by means of the diversion of a portion of the water that flows through the gorge at that point. The plans were prepared by John Berkenbine, president of the Franklin Institute of Philadelphia.

For some time the development of power in the lower gorge at the Falls has been considered; motors have been suggested, made and tried and plans prepared, but as yet there is no important development of power on the lower river. On the Canadian side the commissioners of Queen Victoria Niagara Falls Free Park have had surveys made under the direction of Superintendent James Wilson. The results of these surveys, and the situation as portrayed to the commissioners in a report of Superintendent Wilson, have been presented in the WESTERN ELECTRICIAN, together with a map showing the possible points of development. It has been suggested that a tunnel be constructed on the New York side of the gorge from a point near the bridges to the whirlpool, but the latest idea and the one that appears to have general approval, is to construct a canal at the point referred to.

This canal will have a length of about 5,300 feet and a width of about 100 feet. It will start at a point about 300 feet below the new steel arch bridge of the Grand Trunk railway and extend to the whirlpool. Its course will be alongside or underneath the tracks of the Niagara Falls and Lewiston railway, better known as the Gorge road. The head which it is estimated will be obtained is 45 feet, and it is expected to develop 35,000 horse power, at an estimated cost of \$2,000,000. It has been figured that the amount of water passing through the Whirlpool Rapids is from 100,000 to 275,000 cubic feet per second, the speed of the water's flow being about 21.75 miles an hour. It is estimated that a canal of the dimensions given will divert about five per cent. of the river's flow for power purposes, say 10,500 cubic feet per second. The entrance to the canal will be a monolith of concrete or masonry, having openings through which the water will be admitted. This construction of the entrance is expected to keep out all floating ice and debris. The water that is diverted for power purposes will be returned to the main stream at or near the whirlpool, and is not expected to mar the beauty of the rapids. The power house will be located over the tracks of the Gorge road, in order that there may be a free vent for the water. It is the conception of the promoters that the construction of the canal will be the main expense to be met, as the standard patterns of water-wheels may be used, the plan doing away with expensive wheel-pits and shafts, as well as unusual machinery. The scenic features of the road would not be lessened. The level of the canal will be so arranged as to provide for a maximum fall or raise of 15 feet in the river's level resultant from winds on Lake Erie.

The illustration presented herewith shows the entire route of the proposed canal and the site of the prospective development. It is very evident that engineering difficulties of great magnitude would be met, and the development, when it is perfected, will be notable. It is understood that the promoters of the power company and the officials of the Niagara Falls and Lewiston railway have a perfect understanding about the right-of-way and other privileges, this being that the railway company will grant the power company the right-of-way, with the understanding that it is to receive a royalty on every horse power developed. The road would probably become a customer of the power company. All the necessary changes in the roadbed of the Gorge road would be made by the power company, without cost to the railway company.

The construction of the canal will require the blasting away of the Niagara cliffs and the removal of thousands of tons of rock. All of this excavated material not wanted for the canal walls could be dropped into the river, with full assurance that the current would rapidly sweep it away. The same method employed in hydraulic mining would be used in removing the debris of the slopes where necessary.

Victor Telephone Exhibit at Milwaukee.

The illustration on page 50 shows the artistically arranged exhibit of the Victor Telephone Manufacturing company of Chicago presented at Milwaukee during the Northwestern Electrical association's convention last week. The enterprise of the Victor company in appearing at the convention of the Northwestern Electrical association, which is devoted mainly to electric-light and power interests, is to be commended. But Manager W. T. Blaine does nothing by halves, and the picture illustrates his appreciation of the fact that the artistic in a display of such character is as valuable as an exhibition of meritorious points in apparatus. The room was tastefully arranged with roses and mirrors, and the combination of the color of the American Beauties with the highly polished and finished instruments made the display that excited so much admiration.



ANOTHER NIAGARA POWER PROJECT.

entirely with the president and secretary and protective committee.

Mr. Schuette's resolution was referred to the president, secretary and protective committee, with full authority to incur such expense as was necessary and to raise the requisite funds in such manner as they may deem just and equitable.

No change was made in the amount of the annual dues.

PRESIDENT DOHERTY'S SUGGESTIONS.

The new president, Mr. H. L. Doherty, was presented on Thursday morning, but did not take the chair, as he thought the retiring president should serve until the close of the convention. This innovation was put to a vote and adopted. The thanks of the association were extended to Mr. Copeland, the retiring president, and Mr. Mercein, the re-elected secretary.

During the afternoon session, however, President Doherty did take the chair for a time. He made a few remarks in relation to changes in the by-laws he had proposed the day before, and which he proceeded to explain. He said:

"I see no objection to holding meetings in Milwaukee each year, but perhaps at some future year circumstances might arise when it would be deemed advisable to hold our annual meeting at some other city. I have therefore suggested an amendment to the by-laws in that respect, to read that the annual meeting of the association be held on the third Wednesday and Thursday of January each year, in Milwaukee, or at such other time and place as the directors may elect.

"Another change is to the effect that our by-laws be modified so that the directors of the association can classify the members at their discretion. We have

association's badges being worn simply because they are convenient, and I would suggest that this association adopt a button."

The president made some informal suggestions about the design of a button, and there was also some discussion of the amendment to the by-laws making it possible to hold the annual meetings elsewhere than in Milwaukee. It was proposed to leave the matter to a committee, with power to act, but there was some objection to this. "I do not want to leave it in the power of a committee to fix Chicago as the place of meeting," said Mr. Norcross; "I stick by Milwaukee." Mr. Livermore and Mr. Debell also favored Milwaukee. At length it was decided that the new president's suggestions covering by-laws and badges be submitted to a committee of three, to be appointed by the president, to report as the first order of business at the next annual session. This committee was announced Friday morning. It consists of D. C. Jackson, L. E. Kerns and L. W. Burch.

Mr. Doherty made some further remarks relating to the necessity of every member taking an active interest in the affairs of the association. He said that the association had the largest list of members, but it should also have the largest attendance at its meetings and the largest following of exhibitors.

Mr. Innes of Eagle Grove, Ia., remarked that this was his first Northwestern convention. He thought that especial attention should be paid to the needs and experiences of central-station men in the small towns operating plants of 500 horse power or less. "I think it would be well," said he, "to devote a little more time to the question box and less to

[Continued on page 55.]

Enclosed Electric Furnace.

An interesting experiment was conducted at Armour Institute of Technology, Chicago, last week, to determine the practicability of a new form of electric furnace for producing calcium carbide, with a hollow upper electrode through which the material is to be fed to the arc. A temporary furnace was constructed in the forge-room of the Institute under the direction of I. S. Preñner, engineer for the American Carbide company of Holstein, Ia., for whom the test was made. C. E. Freeman, associate professor of the department of electrical engineering, and J. E. Snow, instructor of practical electricity in the institution, conducted the test and made a report upon the results obtained.

From the accompanying cuts some idea of the appearance of the temporary furnace and the electrodes can be gained. Fig. 1 shows the furnace, with an opening disclosing the position of the electrodes. Another view of the electrodes is given in Fig. 2, and Fig. 3 shows the condition of the furnace immediately after the current had been turned off.

It is proposed to employ an enclosed furnace in order to take advantage of the increased temperature thus obtained and permit of continuous operation as long as the electrodes last, which, it is estimated, will be about one week. Owing to certain limitations in regard to time, the arrangements for the test were by no means as complete as they might have been, and this fact is considered in the report.

The form of furnace tested, as already mentioned, was one having a hollow upper electrode, through which a powdered mixture of 60 per cent. lime and 40 per cent. coke was fed. The lower electrode was solid, having a superficial area of about one square foot; the upper one consisted of four four-inch by

During this time a little over five pounds one ounce of carbide, or eight pounds per hour, was produced. Considering the time lost in feeding, this would approximate 16 pounds per hour, or 384 pounds per day."

Commenting upon the crude apparatus employed in the tests and other drawbacks, Professors Freeman and Snow said:

"In view of the fact that in order to observe the operation of the furnace the front was left open—the sides and back being but partially closed—a strong draught was created, which seriously impaired the efficiency of the arrangement. This was clearly shown in the accumulation of the product at the rear of the arc.

"During the run an average of about 35 horse power was delivered in the arc.

"Considering the various losses attending this test, it is safe to predict that its present efficiency can be increased 100 per cent. by the application of suitable arrangements for feeding, prevention of draught and removal of product."

The American Carbide company will erect a plant at Maquoketa, Ia., where good limestone is abundant and water power available. The initial plant will have a capacity of 1,000 horse power. The furnace will be designed to take 8,000 to 10,000 amperes at 100 volts.

Aluminum as an Economic Factor.

By FRANKLIN H. WENTWORTH.

Kind mother Nature looks ever compassionately upon her children, and when certain of her bounties necessary to their well-being are lost to them, either through physical weakness or lack of wit,

seems discouragingly slow. In the '50's the French were making aluminum at about \$3 a pound. They proposed then to use it for helmets and cuirasses. To-day, by the most improved processes, it costs at least 20 cents, notwithstanding the fact at least one-twelfth of the solid crust of the globe is composed of it. It is perhaps the most abundant element upon the earth surface, next to oxygen and silicon. But the extracting cost must be halved, and halved again, before it will cut more than a passive figure in the economics of electrical progress. Its specific gravity is much less, and therefore, from certain viewpoints of engineering, it is more desirable for use than copper. Its lesser conductivity will, however, all things considered, prevent its taking the place of the heavier metal except where price alone is the determining factor.

The copper trust can flood the market with copper at six cents a pound and make a fair profit. The present prices are, of course, non-competitive, and therefore naturally excessive. Man seeks his own good at the whole world's cost. So long as the laws permit monopoly those persons enjoying it will make what they can. There is no reason why they should not. The wrong is not individual; it is institutional, and therefore cannot be remedied by attacking individuals. The wide difference at present between the cost prices of the two metals, copper and aluminum, makes the outlook none too bright for those manufacturing interests which are now at the mercy of the copper monopolists—dependent on their pleasure—as, for example, the manufacturers of insulated wire. The price of copper, if further arbitrarily raised, must eventually force all similar manufacturing interests into consolidation. By consolidation a great saving is effected in the cost of the conduct of business. While there is free competition between similar interests, business success makes the employment of able men imperative. But department managers and expert salesmen who demand salaries of from \$3,000 to \$5,000 per annum under a competitive system are a needless expense as soon as competing establishments consolidate. The product then being monopolized and the competitive factor eliminated, order clerks alone are necessary, and high-priced men may be dismissed.

However unpleasant the prospect, it will in no way profit the electrical fraternity to close its eyes to these obvious facts. True conservatism consists in understanding the situation, facing it bravely, and making the best of it; not in shirking the issue until all is hopelessly involved.

It must be daylight plain to anyone who thinks, that if aluminum or something else does not speedily come to the rescue and loosen the grip of the copper monopoly, many able electricians will be forced into other lines of effort; and as the same concentration is taking place in other fields, from similar causes and working similar results, they are much more likely to be forced into idleness. This will clearly work injury to all companion industries, from the maker of a porcelain insulator to the publisher of an electrical journal. Men are quick to resent individual oppression; but when they suffer as a class they seem singularly slow of apprehension. The manufacturer should be able to comprehend that he is in the same boat with his workman. This will be readily apprehended when, the consolidation once effected, he finds that the benefits of the saving made by discharging his valuable men does not accrue either to him or to the other manufacturers in the pool. For, being still subject to the exactions of the basic monopoly, these savings in management can be squeezed out of their pockets by the same process that forced their consolidation. Thus, eventually, unless something intervenes, each entire business must be forced into the hands of those who control the natural resources from which the raw material that enters into the several products is drawn.

The vague and unsatisfactory attempts of the national and local governments to regulate trusts and monopolies have always proved, and always must prove, abortive. Not only is the best legal talent of the country employed by these large combinations, but all such attacks as have been so far made are wrong in principle. They are aimed at the manifestations of monopoly, instead of at monopoly itself. It is not the government's business to say how much money a man or a corporation shall have; but it may be its business to say how the money shall not be gotten, should the manner of getting it violate the natural right of others. All attempts to regulate trusts have so far begun at the wrong end. The trust, in so far as it is purely an economizer in production, is legitimate. Monopoly of natural resources is another matter. Monopolies of this sort are built up by unjust systems of taxation, and they can be easily destroyed by just systems of taxation.

That this truth is coming to be clearly and definitely recognized is evidenced by the opposition shown to the present governor of Michigan in his attempt to assess the property of monopolies in that state on the same basis as other property.

If the holdings of the copper trust were assessed at their true value by the states in which they lie, it would not be necessary for the electrical industries to turn to aluminum for relief. We would have plenty of copper at a reasonable price.

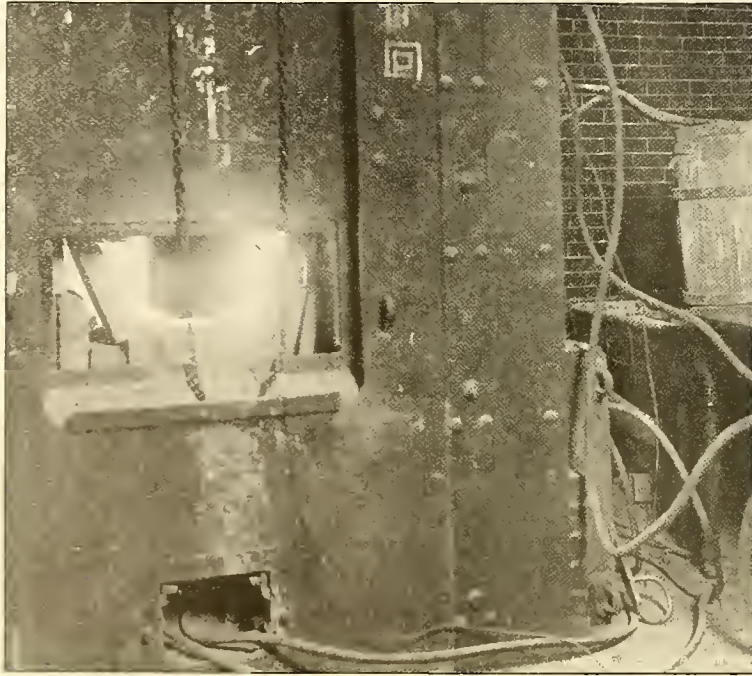


FIG. 1. ENCLOSED ELECTRIC FURNACE.

four-inch carbons bound together, and having a hole $1\frac{1}{4}$ inches square through the central portion. In the illustrations the upper electrode is seen through the aperture in the front of the furnace, protruding downward. The lower electrode has the appearance of three fire-bricks side by side, and extending upward at the right and left are two slabs which form a sort of enclosure about the upper electrode and restrict the space into which the carbide is admitted. This arrangement also served to confine the heat generated.

After running until necessary adjustments had been made, a quantity of the powder mixture that had been prepared was introduced enclosed in a paper cartridge. It was found that this method of feeding was not desirable, as the powder was not sufficiently compressed to retain its form after the paper burned away. The result was a choking of the furnace and considerable time was consumed in clearing away the refuse.

Another method of feeding was adopted by introducing the powder in a loose form. An objectionable feature of this method was unavoidable irregularity, owing to imperfect arrangements. The result was that the furnace was not working continuously as regards the powder. Accordingly, it was found desirable to employ the method of feeding the material in compressed form, and experiments will be continued with the view of determining the size of cartridges best suited for commercial work. Other modifications may be introduced, such, for instance, as feeding from more than one point. The object is to determine the exact capacity of the arc employed for collecting and the most favorable conditions under which the enclosed furnace may be operated. In the experiments last week Professor Freeman reported that the feeding began at 3:38 and was discontinued at 4:10, making a run of about 40 minutes.

she does what she can to compensate them, as a kind mother should. She offers few things to the satisfaction of man's wants for which, on occasion, she has not a substitute; not so perfect, mayhap, not quite so desirable for a special purpose, but an alternative nevertheless. She has given to those who would seek out the secrets of her lightnings a fitting vehicle for their transmission—copper, copper in quantities so vast as to oppress the imagination. But here she sees an astonishing proceeding. She sees these human atoms, for whom she has provided so bountifully, at the strange task of parceling out to a few those resources which she gave freely to all. Once in possession, these few become the dispensers of her bounty, laying all others under tribute. But nature hates a monopoly. There is something of justice in her fiber. Pityingly she takes her weakling by the hand, saying, "Thou hast not wit enough to keep that I give thee, but thou art still my child. Behold!" Seizing a bit of common clay, she holds it for an instant in her alambic—and gives to him aluminum.

The recent advances in the price of copper, due to rumors more or less authentic that a combination of the copper interests of the world is under way, has given a renewed impulse to experiments in aluminum production. The electrical world is unmistakably waking up to the fact that unless it can find a competing factor, it will soon be helpless in the hands of those who control the natural resources upon which depend its life and growth. It sees a ray of hope in aluminum. By its discovery every clay bank is converted into a mine of precious metal. But the secret of its simple extraction is not yet discovered, although recently fair strides have been taken in that direction. Contemplating long periods progress seems rapid; but in the face of threatened immediate copper monopoly, it

Telegraph Construction in Cuba.

Mr. E. J. Nally, assistant general superintendent of the Postal Telegraph-cable company at Chicago, has received an interesting letter from John A. Miner, who is now engaged in building telegraph lines for the United States Signal Corps in Cuba. The letter was written on Christmas, at the Signal Corps camp, 36 miles south of Puerto Principe in Cuba. Mr. Miner was a Postal operator at Davenport, Ia., and is well known to the telegraph fraternity of this section of the country. His letter furnishes a fair idea of the difficulties encountered in establishing telegraph service in the new possessions of the United States:

I have finally brought up in this country by the necessity of a line from Principe to Santa Cruz, where there is cable connection with the outside world. We are building a temporary line at present on lance poles, and making all the ties to trees and old Spanish poles wherever possible. The distance is 66 miles, and it is 66 miles of the wildest and most desolate country at present one ever saw. There is evidence everywhere that this country was once in a very advanced state of civilization, but four years of war have devastated it of everything like civilization. We are

line had been strung but a week ago with the heaviest copper wire known to the trade. Every combination known to the operator's art failed to bring a response from the circuit. Finally, by the use of other circuits, it was discovered that a break existed somewhere between Omaha and Blair, Neb., 40 miles distant.

"A line gang started out early this morning. Scarcely had the suburbs been reached when a novel discovery was made. No wire was to be found on the poles along which the copper was strung at such great expense but a week ago.

"The poles were there and the glass insulators, and in some places a few shining threads of copper indicated where the wire had been 40 feet in the air, but the wire was gone.

"The gang kept on up the line for several miles before the end of the wire was found. The whole line for this distance had been removed as cleanly as if veteran linemen had done the work.

"Now the Western Union has agents running around town examining junk piles for several hundred pounds of copper wire.

"The supposition is that thieves went to work early and continued throughout the night to steal the copper for its bulk market value. The thieves probably made \$100 by the night's work. During that time they must have climbed many telegraph poles and taken as many chances of dropping to the earth below and being killed, but apparently the theft was committed without an accident."

Mechanical Surface-contact Railway System.

American engineers will be interested in the latest development of surface-contact systems claiming attention abroad. The plans provide for a system relying on mechanical apparatus. It was invented by Herbert Allen and Oliver Peard, and primarily depends upon the wheel of a tram-car depressing the end of a pivoted lever, which raises, through the medium of a rod, a surface contact placed in a box which is bolted to the side of the rail. The contact is then gripped and supported by a special form of collecting device carried under the car. Immediately the vehicle has passed, the contact drops back into its seat, which is flush with the roadway. The contact, on engaging with the collecting device, is still further raised by means of the collector, and it is only when the contact is so raised that it becomes alive. This is claimed to be an important safety factor. In Fig. 1 *c* is the end of the pivoted lever placed in the groove of the rail. Upon being depressed it operates the lever arm *c'*, which pushes upward the spindle *d*, on the summit of this being contact plate *e*. But the depression of *c* accomplishes more than merely pushing up the contact above the street level. It will be seen that the spindle *d* carries a projecting arm, indicated by *h*, and upon the subsequent raising of the contact by the collector, this comes into contact with copper brushes *j*, which are in permanent connection with the feeders. It should be mentioned that the operation of *d* is against the tension of a spring, *k*, so that when the contact, *e*, has been released by the car, it is pulled sharply back into its seating.

Fig. 2 illustrates how the contact is held by the car-collectors during the passage over the stud; *c* simply rests upon plates *o*, thus giving effective connection between the car and the mains.

The inventors claim that it would be impossible to operate the lever by any other means than the car-wheel, as no other vehicle could run in the groove of the rail, and it would need a considerable weight to actuate the mechanism. Should anything go wrong with the mechanism of the box, the inside is so arranged and attached to the lid as to permit of its being removed and replaced in a few minutes. This system permits of the car running in either direction, as one box is not dependent on another for its actuation. The inventors claim, too, that the system could be established at a less cost than that of a first-class trolley line. The cuts are reproduced from the London *Electrical Review*.

Situation in the Copper Market.

Copper continues to "boom." At the close of last week the quotations in New York reached 15 1/2 and 15 1/4 cents a pound. Buyers are very active, and as the quantity of the metal available for early delivery seems to be limited the price has continued to rise. Some of the dealers go so far as to predict 20-cent copper inside of six months. Others are more conservative. A representative of one of the largest metal houses in New York is quoted as follows: "The recent advance in copper is certainly bona fide, and, I might say, has taken place in the absence of almost any speculation whatever. We have at this date not a single speculative contract on our books. Consumption, both here and abroad, is enormous and far exceeds the production, and as far as we are able to judge the situation will continue for some considerable time to come. All the producing companies, none excepted, are sold ahead entirely for the next two months, and large contracts have also been booked for later deliveries. Copper will go to 16 cents in the near future. Copper is king; everybody wants it, in fact, is crazy for it. Fifteen and one-fourth cents is freely bid this [Saturday] afternoon, but no sellers at this price."

Naturally, new copper-mining companies are springing up like mushrooms. In Boston, according to the *News Bureau*, the brokers are having lots

of fun with the new copper companies. They are not called "cats" or "dogs," but "rabbits," some of them "jack rabbits" and some of them just "rabbits," because they multiply so rapidly. Some of the more recent ones are classed under the heading of white mice. "The active head of one of the big copper companies smiles sarcastically," says the Boston authority, "and denominates the new copper promotions as jackpots, because, he says, it takes two knives to open one. But it is just these rabbits, white mice and jackpots that are liable to make the price of copper in the future, not this year or next; but some of them have chances of becoming great mine" with good management. For 20 years the bane of the copper market has been the small copper producer who offered his 100,000 pounds of copper all over the world with such importance as to break the copper market without effecting a sale.

With it all, the talk of syndicates to control the copper output of the country continues. The *Chicago Tribune* asserts that there are two—one chiefly an English syndicate, in which the Rothschilds are interested, seeking to gain full possession of the Montana mines; the other, made up of American

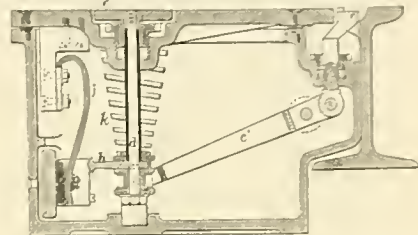


FIG. 1. MECHANICAL SURFACE-CONTACT RAILWAY SYSTEM.

capitalists, seeking to purchase developed and undeveloped copper lands in the Lake Superior region. The *New York Times* of January 21st said that the rumor of a copper syndicate had been revived, but that J. D. Rockefeller authorized the statement that he was not interested in any such transaction.

INDUSTRIAL COMBINATIONS.

Articles were filed with the secretary of state of New Jersey on January 14th, consolidating the Bergen County Gas Light company and the Englewood Electric Light company into the Englewood Gas and Electric company, with an authorized capital of \$400,000.

From New York it is reported that the American Steel and Wire company believes it has succeeded in obtaining control of practically all the steel and wire plants in the United States, which are mostly free of debt, except an obligation of about \$2,000,000 on the Washburn & Moen plant. The company has, it is said, net current assets of about \$15,000,000.

The United States Carbon company of Cleveland desires it to be known that "it is in no manner connected or associated with the new carbon trust." It asserts that it is thoroughly equipped with the largest and most improved carbon machinery in the world, and is prepared to manufacture and supply all varieties of electric-light carbons. It does not wish the electrical trade to be misled into the idea that all the

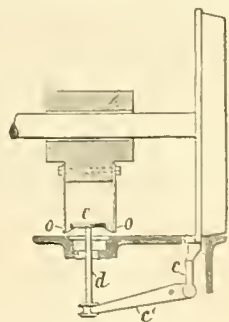


FIG. 2. MECHANICAL SURFACE-CONTACT RAILWAY SYSTEM.

carbon companies are included in the new consolidation.

According to an Associated Press dispatch from New York, dated January 22d, arrangements have been completed for the consolidation of the illuminating and natural-gas and electric-lighting properties, plants and franchises in central and southern Indiana and Ohio. E. C. Benedict, who has large investments in gas property throughout Indiana, is the principal factor in the combination.

It is now stated that the negotiations begun a month ago for the consolidation of all the city and suburban electric and traction railways of Baltimore have been completed. Alexander Brown, representing the Elkins-Widener syndicate, which first bought the Baltimore City Passenger Railway lines, has accepted the proposition of the Consolidated company to sell its stock at \$37.50 a share. With the acquisition of the City Passenger Railway company's stock at \$80 a share, calling for \$12,000,000, and the consolidated calling for \$13,758,000, the deal involves \$26,000,000. Three months ago Consolidated Railway stock had not reached its par value of \$25. Under the deal just effected the \$9,000,000 stock distributed at the formation of the company will return over \$13,000,000.



FIG. 3. ENCLOSED ELECTRIC FURNACE.

following an old Spanish telegraph line which was completely destroyed by the Cubans three years ago. There is quite a lot of Spanish poles standing, but there is not a piece of wire to feet long left. The poles have been standing for about 20 years, but they are what is called ironwood and hard as a rock. It is impossible to sink a spur in them and all our ties have to be reached by ladder. They used the queerest insulators and the brackets are of iron. It is impossible to drive a nail in the wood. But the Spaniards fastened their brackets by drilling a hole through the pole and bolting the brackets clear through.

We build at the rate of about five miles a day across the prairies, but we have been over two days at times getting a half mile of wire strung through some of the forests where we have to cut our way through. We have a force of 30 Cubans cutting poles along the line, and as soon as we get communication through to the cable connection we start back and transfer the wire to heavier poles. We have already left two test stations 12 miles apart, and will provide for another here when we leave. We now have a courier line from the last station to the sea. We leave an operator and lineman at each station, so that they will not be tedious. I am to stay at Santa Cruz until the line is finished and then will probably go back to work at Principe. Our chief signal officer for this division is Lieut. Shepherd, an old operator and at the outbreak of the war a signal sergeant in the regular army.

It was he who volunteered to go out in an open boat from the cruiser *New York* to cut the cable at Santiago. He was successful, as everybody knows, and for that act was made a first lieutenant. Before we started we put in a telephone system connecting all the different camps with the headquarters in town. I have several of the insulators the Spaniards used, and am going to take them home as souvenirs of my part in the construction of a military telegraph line through the wilds of Cuba. They will make excellent paper weights. They used porcelain exclusively and very heavy wire.

The country where we are working now is full of guerillas and last night we went over and witnessed a Spanish fandango. It was the most weird spectacle I ever saw. It beats a cake walk or a ghost dance. Now that the war is over, people are moving out on their farms again and things will boom. They all seem to

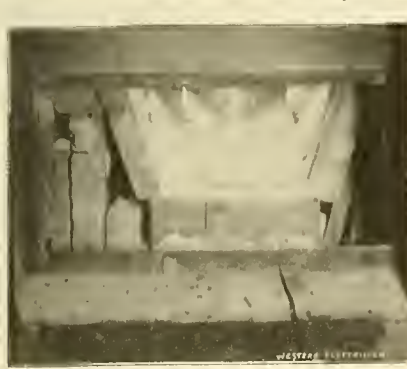


FIG. 2. ENCLOSED ELECTRIC FURNACE.

think that this island will be a veritable paradise when it gets "Americanized," as they say.

We expect to stay here until about May 1st, and then go back to the States. The people in town are inhaling American customs already. They have ordered two patrol wagons of the Studebaker Wagon company. We use the lines of the Cuba Submarine Telegraph company out of Santa Cruz. I don't know what line they connect with in the States, but hope the Postal.

Daring Theft of Copper Wire at Omaha.

Copper is getting so expensive that it seems to be dangerous to leave it outdoors over night. At any rate that seems to be the inference from the story telegraphed to the *Chicago Tribune* from Omaha on January 20th:

"This morning when the Western Union operators cut in their crack through circuit from Omaha to Minneapolis and the British Northwest the instruments failed to work.

"This was the source of much surprise, as the weather conditions were first-class. Then, too, the



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The Chicago Telephone company has managed to survive the period of depression, and, according to the annual report presented on another page of this issue, it is in a fairly healthy condition.

Chicago needs improved street railway service and it is admitted that the only way to secure it is by abolishing the cable and substituting electricity on all surface as well as elevated lines.

dermen have signified their willingness to take the matter up, and there is a chance that an agreement may be reached. Mayor Harrison wants a conduit electric system, but the street-railway men say this is simply out of the question.

When the bill to grant the Pacific Cable company a subsidy of \$100,000 a year for 20 years for the construction and operation of a cable across the Pacific was called up in the House of Representatives on January 18th a very spirited debate followed.

In a measure, at least, the experiments in "drawing sparks from the clouds" by means of kites which are being conducted at Bayonne, N. J., by William A. Eddy have proved successful, although it is said that the length of the sparks is much less than was expected.

One result of the agitation of street-railway matters in Chicago has been the development of a strong feeling favorable to the proposition looking to the acquirement of street-railway properties by municipalities.

A petition to the Legislature was adopted which will be circulated throughout the city and state for signers, requesting that "hereafter all laws or ordinances affecting street railroads, gas or electric lighting, telephones, water supply or other public utilities, shall contain provisions requiring ratification by a majority of the legal voters residing in the municipality affected by such laws or ordinances."

The alarmist has reappeared to proclaim another danger attending the use of the telephone. "More cases of grip have been coughed and sneezed into the telephone to be contracted by the next user of the instrument, than have proceeded from all other sources combined."

is contracted from telephone receivers, and the receivers should be kept clean."

On general principles the advice of the New York physician should be followed in the matter of securing cleanliness, but there is reason to believe that the danger which he points out has been greatly exaggerated.

Heretofore telegraphic communication between the old and new worlds has been maintained over submarine cables controlled by American, English, French and Spanish interests, but now there is promise of a distinctively German enterprise, backed by governmental influence and supported by public funds.

A decision of importance to companies that must put wires underground, but which is not to be officially reported, was rendered recently by the Court of Appeals of Kentucky, in the case of "Cain's administrator against the Ohio Valley Telephone company."

After the plaintiff's evidence had been introduced on the trial, a verdict for the company was directed, and the Court of Appeals now affirms the judgment in its favor. It points out that the decedent was shown to have been an experienced driver in the city, and that he knew that he could reach his destination by taking another route, and that it was perfectly clear that he took the course he did voluntarily and with a full knowledge of the surroundings, as it was daylight and there was nothing to obstruct his vision, and there was no testimony that he was either induced or directed by the servants and agents of the company to take this route.

This decision will go far toward establishing the rights of electrical companies engaged in construction work and fix the limit of their responsibility for accidents growing out of the condition of a roadway that has been disturbed by them.

MILWAUKEE CONVENTION.

[Continued from page 51]

abstruse affairs." He added: "It may be true, as was said here yesterday, that belt transmission is a thing of the past—that is true, speaking technically—but practically, for us in small stations, the truth is not applicable, and we are not going to throw away our belts. In fact, there are cases where it is impossible for us to use large units in our plants without the flexibility that belts give us."

MISCELLANEOUS AND CONCLUDING BUSINESS.

On motion of Mr. Korst the president was authorized to appoint a delegate to attend the annual meeting of the National Electric Light association in New York in May. Secretary Mercein was appointed by President Doherty as the delegate.

J. M. Hill, who had charge of last summer's excursion-convention, sent a telegram from Hartford, Conn., reading as follows: "The association has my heartfelt wishes for a pleasant meeting and profitable convention."

On Friday morning the convention was adjourned.

READING OF PAPERS.

On Wednesday afternoon Mr. B. J. Arnold of Chicago made an address on "Trend of Central-station Design," which was listened to with interest and discussed. The next paper was on "Systems of Meter Rates," and was read by Mr. E. L. Debell of Sheboygan, Wis. This was a live subject and was discussed at length. Professor A. J. Rogers of Milwaukee read a short but interesting paper on "Electricity Direct from Coal," and this concluded the day's programme of papers.

Professor D. C. Jackson of Wisconsin University, Madison, Wis., read his paper on "Inductive Loads (Arc Lamps and Motors) on Alternating-current Transformers" on Thursday morning. A discussion followed, and then Mr. George L. Thayer of Belle Plaine, Ia., read a paper entitled "Design of Secondary Circuits in Alternating Plants." The discussion of this paper took the members until the hour of adjournment.

"Electric Vehicles and their Relations to Central Stations" was the subject of H. M. Maxim of Hartford, Conn. Mr. Lord read the paper on Thursday afternoon. There was no discussion. Mr. J. H. Harding of La Porte, Ind., then read the last paper of the meeting. His subject was "Utilization of Exhaust Steam." This interested the members in a practical way, and many inquiries were made.

QUESTION BOX.

Three questions were submitted for discussion on Wednesday morning:

1. What is the best way to enlarge the arc, incandescent and motor capacity of a plant that is now "filled up" in all departments?

2. For a plant in a small city, no day circuit, services to midnight only, what method of charging for lights would give best satisfaction to company and consumer?

3. Which of following methods would give best satisfaction in supplying lamps: (a) Plant to furnish lamps free and change them when burned dim. (b) Plant to charge for first lamp; renewals free; customer to pay breakage. (c) Plant to sell lamps at cost; no free renewals. (d) Customer to buy lamps in open market, plant having no restriction as to make.

Mr. Doherty: It looks as if the only answer to the first question was to build a new plant. But a great many interesting points might be brought out in that question. For instance, if the station was filled up in every department yet the managers might not have the money or feel that it was advisable to put in a complete new plant, new arc machines, new alternators, and might want to make an increase in one line this year and in another line the next. There are a dozen different ways of doing that—putting arc lamps on the transformers around the station, cutting them in and out with knife-blade switches, etc. I do not think that there is an automatic switch now on the market for alternating currents, but one is expected soon. There is a switch for the direct current working by clockwork, throwing lights on and off, on circuits like the Edison, and where they do not use series lamps. I would hardly undertake to answer the question, but I may suggest that an alternator with reserve capacity for future needs, that would enable them to lighten up the load on the arc machines and take on more lamps, might be put in. Then they could transfer service back and forth between one department and another, and in that way save considerable on the enlargement of the plant.

Mr. Schott: There is only one way to answer this first question, outside of the arc end of it. On the incandescent and power side, the true way to take care of it is to put it on the meter basis. On the arc end, if the station be equipped with straight series arc apparatus, while it can be metered, it is not exactly what you might term practical. I know of one town that within the last two or three years was placed in this position: they had overhead circuits, and they were forced within a given district to go under ground. In that underground district they had in the neighborhood of about 25 miles of arc circuit, while the question of ducts, cables, etc., necessary to place series arc commercial work underground meant quite a large sum of money. On

the other hand, changing from the series arc at a flat rate over to the incandescent circuits and on a meter basis meant quite a loss in the income, but after considering this matter very thoroughly, they finally concluded to adopt the enclosed style of lamp on a meter basis. The result was that the increase in cables, etc., was very slight over what they had been obliged to use before in operating their incandescent end of it, and the first year the loss in income was \$21,000, but the third year has proven that the average rate received for arc lamps connected is higher than when it was on a flat-rate basis. They avoided the increasing of the capacity of the station: they avoided the additional investment in conduits and cables. As a rule, when customers change from the series arc to the enclosed arc, they are not as well satisfied as they were before, for the reason that the series arc light will throw more light on the ceiling, but after the service has once been put in effect, the customer grows used to it, and knows that he can turn the arc on any hour of the day or night, and sees the advantage of it. In two years you can convert any man, no matter how far he has been on the other side of the fence. I think the only way to take care of the business and provide for additional capacity without increasing your station is as stated.

Mr. Livemore: If an incandescent plant is wired up altogether to four-watt and 3.6-watt lamps, if the regulation of that plant is good enough, they can use a three-watt lamp and increase their capacity very largely in that way on the incandescent lamp and on the alternating business. Where they are using the new three-wire transformers, which are made now of very high efficiency, a very material saving can be made in the dead load carried by every alternator, and in every plant using the old type of transformers made previous to four or five years ago. I know that in my case I have made a plan which I am going to carry into effect at once, by which I replace 49 old-type, two-wire transformers with 11 three-wire secondaries. This change alone in the dead load carried by my alternating machine will make a difference of eight amperes, at 1,100 volts, and in that way you can make a very material saving.

Mr. Debell: That question (referring to question No. 1) was suggested by myself, and I will state that the largest part of the business of our plant is done on a meter basis, and that as high efficiency of lamp is used as we think the station will stand in an alternating system. We have concluded that the only way to increase our capacity in the direction needed is by putting in additional machinery, and what we principally wish to know is what kind of machinery would be best put in—the simplest arrangement that would allow us to take on more business. The machinery in use now is an alternating system for incandescent lights, straight series arcs, for doing street and commercial lighting and 500-volt power service.

Mr. Frund: In reference to this first question I may say that we had three years ago two 60-kilowatt alternators, very well loaded on nearly four-watt lamps, and the question arose as to the advisability of putting in more machinery. On a 100-volt secondary it was a pretty hard matter for us, under test submitted, to get anywhere a three-watt lamp, but we finally had a manufacturer that furnished us a 3½-watt lamp; and in that way we avoided putting in new machinery for the time being, but in a very short time that extra installation was taken up. We were then running on a flat rate, very satisfactory to us, but it meant another expenditure of something like \$8,000 on the incandescent plant for new business. The question resolved itself into this, whether it would pay us to put in meters and run the risk of reducing our income. Having seen some of the results in other plants, where the meter rate reduced the income considerably, we were in doubt, but we finally resolved to put in meters, and the consequence of this was that a 60-kilowatt machine did the work, where we required two machines of 60 kilowatts each before. It took us nearly two years to get on our feet, but now we have a very satisfactory service, and while it was a severe blow at the beginning, and though we had a great many people who thought we were making money head over heels, as it were, and thought we should give them more light than we were under the meter rate, yet they found afterward that the rates were fair, and we have no trouble at all now on meters or with meter rates.

Mr. Thayer: In Cedar Rapids, near where I live, there is a typical plant of the old style, that is, with alternating currents, small transformers, 500-volt power circuit and series arcs. They have reached the limit of their station, and last year they began putting in two-phase alternators and throwing out a good many of their old transformers, and they are gradually changing their power business, wherever practicable, into two-phase motors, with the intention of ultimately throwing out all of the 500-volt system and running just their alternators for the day load. The series arcs they would keep—the street circuit on series—but they are installing a good many more—all their extra arcs are going on the alternators. They are using a few big alternators rather than a number of the small types of the smaller machines. That is the way one large plant solves the question.

Mr. Grover: I would like to add a question to that list in relation to power. We have recently

installed a power plant. It appears that nearly every station that I can find in the state that furnishes power furnishes it on a different basis. There does not appear to be any established rate for power. I think that there should be some committee appointed on that line, the same as we had on incandescent rates previously, to get the uniform rates of power, so that we can find out how cheap it can be done. Since starting the power circuit I have had one man come in and say, I can go over to Sheboygan and get it for so much, and to Madison for another rate, and go down here to Kenosha and strike something else. Well, the amount of it is, you get the rates all around and nobody knows what the rates are. What I would like to know is, how cheap I can do it and still make a dollar out of it.

In reference to the changing of a plant to a meter rate from a flat rate, the gentleman that has spoken speaking of the decrease in revenue in changing from contract to meter, has had a different experience from mine. I have found it to be just in the reverse. In two plants which I have changed over from contract to meter, I found that the revenue went down the first year about 20 per cent., and operating expenses decreased about 33 per cent., and the second year the income increased 50 per cent. and the operating expenses still remained about 30 per cent.

Mr. Thayer: Where a man has a certain number of lights and he burns them regularly every night, and certain hours, we do not say much to him, but if a customer wants light which he expects to burn at unusual or intermittent times, we either name him a high contract rate or a meter rate such as would be to his advantage to go on. But we make the distinction also that a good many plants do not, in giving him a discount for long-hour service, and not on the amount of light used. It may be that he is a customer who closes early, and uses an immense number of lights, up to our capacity, and then he shuts his lights off. Our first efforts were to charge him a rate of 33 cents a month per lamp and five cents a 1,000 watts by meter. That was made to fit into the rate that the customer had been receiving. We have followed practically the rates of the Chicago Edison company, charging 20 cents a 1,000 watt-hours on a 3.1-watt-lamp basis for the customer's average the year round, and half a cent for all succeeding hours. That rate gives us an equivalent rate of about 13½ cents a thousand watt-hours in a store, as the lights are usually burned, and it has the additional advantage that if a man wants to take extra long hours, instead of paying in the neighborhood of 14 or 15 cents, he is only charged 10 cents for that extra burning. For the first hour during the six lighter months, and the first hour and a half during the six winter months, we make a modification, and that is to forestall the time when we will put in meters, and if a man loads up his store for the holiday season he has got to pay for it, but at present it has the advantage of equalizing bills, cutting down the heavy winter bills and making the summer bills a little larger. I think you will find in changing over to a meter basis you have trouble with heavy winter bills, and if you get a system of discount by which you can cut down your heavy winter bills, you may get more for your customer by the year than you can get by letting his bills run way down in summer time and way up in winter time. We go on the basis that a short-hour customer has got to pay a large price and a long-hour customer will get a very substantial reduction on the rates, and so far we are gradually working over onto a meter basis, and we have got, I think, 40 or 42 per cent. now on meters; and that has all been done within three years, and so far we have kept right at it, and whenever we can nail a customer to get him on meter we do it, and in time we will have pretty nearly everybody on meters.

SOCIAL FEATURES.

The social features consisted of a lecture and electrical entertainment in Plymouth Church on Wednesday evening and the banquet of Thursday evening.

The lecture was given under the auspices of the association by Mr. Frank L. Perry of Chicago, whose subject was "Curious Things Electrical." It was the desire of Secretary Mercein that such an entertainment be given with the idea of "popularizing the subject," and the lecture was given with that object in view rather than for the benefit of men already surfeited with knowledge of "Curious Things Electrical." It was estimated that an audience of 600 heard the lecture and witnessed the experiments. Among the "curious things" dwelt on by the lecturer were the alternating current, as shown by specially constructed motion slides, wireless telegraphy, Edison and Tesla's views on the most "curious things electrical," electrical execution chair of Sing Sing prison and Tesla's rotary field. A description was also given of Mr. Perry's trip some years ago under water on an electrically driven submarine boat. The experiments presented were novel. A telegraph instrument was made by combining a large electromagnet, two chairs, a piece of sheet-iron and a rubber band; lengths of wire were electrically treated red hot to illustrate various applications, and an iron box was burned into by aid of a carbon rod connected with the Edison street circuit, introduced to the stage for this occasion. According to the complimentary notice in the Milwaukee *Sentinel*, pub-

lished the following morning, the explanation of wireless telegraphy proved "intensely interesting," and the lecturer, in his practical demonstration of how burglars employ electricity to open safes, "dazzled the eyes of his audience by the brilliancy of his operations in burning holes through iron plates with carbon sticks charged with electricity." Mr. George W. Patterson of Chicago followed with a pretty exhibition of Indian club swinging with electrical effects.

The banquet on Thursday evening proved a most enjoyable affair, and was, as usual, well attended. Secretary Thomas R. Mercein presided as toastmaster and performed the duties of his position with ease and grace. Toasts were responded to by the mayor of Milwaukee, ex-Governor Peck and Mr. Weld, also of Milwaukee, B. E. Sunny, Pliny Norcross, H. L. Doherty, E. H. Abadie of St. Louis, William S. Hine, James Wolff, A. C. Shaw of the Electrical Engineer, Willard Low, Professor Jackson, F. L. Perry and a number of others. After the banquet those in attendance were most hospitably entertained in the parlors below by the Wagner Electric Manufacturing company and the Electric Appliance company of Chicago.

MEMBERS AND VISITORS.

Among those present were the following-named gentlemen:

Table listing names and locations of members and visitors, including Abadie, Eugene H. (St. Louis), Adams, H. E. (Chicago), Austin, M. L. (Chicago), Barr, Edward L. (Chicago), Bean, W. Worth, Jr. (St. Joseph, Mich.), Boyer, F. N. (Chicago), Bragg, Wm. P. (Monroe, Wis.), Brown, W. A. (Chicago), Burch, L. W. (Madison, Wis.), Chacker, E. W. (Chicago), Chanood, H. O. (Quincy, Ill.), Colbert, F. E. (Chicago), Collins, W. Forman (Chicago), Condit, Sears B., Jr. (Boston), Copeland, F. A. (La Crosse, Wis.), Culver, J. H. (Decatur, Ill.), Cutter, George (Sheboygan, Wis.), Debell, E. L. (Chicago), De Sternecke, Paul M. (Chicago), Doherty, H. L. (Madison, Wis.), Downs, B. B. (Chicago), Foote, Allen R. (Washington, D. C.), Ford, F. H. (Madison, Wis.), Foster, W. H. (Geneseo, Ill.), Friend, H. W. (Vincennes, Ind.), Galt, C. T. (Chicago), Grover, T. F. (Fond du Lac, Wis.), Hamacek, A. (Chicago), Harding, J. H. (La Porte, Ind.), Hay, Chas. E. (Springfield, Ill.), Hine, Wm. S. (Chicago), Innes, Geo. (Eagle Grove, Iowa), Kaimeyer, C. E. (Chicago), Keller, Leo (Chicago), Kerns, L. E. (Madison, Wis.), Kittman, L. W. (Chicago), Korst, P. H. (Racine, Wis.), Koutz, R. F. (Neilsville, Wis.), Little, A. McNab (Chicago), Livermore, S. B. (Chicago), Lord, Irving P. (Waupaca, Wis.), Low, Willard W. (Chicago), Markley, Jos. C. (Beloit, Wis.), Messer, Charles (Chicago), McConnell, W. J. (Chicago), McCulloch, W. E. (Beardstown, Ill.), Mercein, Thos. R. (Milwaukee), O'Brien, James B. (Chicago), Overbagh, Frank (Chicago), Paige, C. C. (Oshkosh, Wis.), Patterson, Geo. W. (Chicago), Pearce, C. H. (Ishpeming, Mich.), Perry, F. L. (Chicago), Pletzcker, E. J. (Chicago), Plockard, W. R. (Chicago), Pomeroy, J. G. (Chicago), Raymond, Francis (Chicago), Rex, Geo. P. (Chicago), Rousseau, A. J. (Chicago), Schockley, B. J. (Decatur, Ill.), Schott, W. H. (Chicago), Scribner, Jesse (Chicago), Snow, A. C. (New York), Smith, Wm. M. (Milwaukee), Smith, A. (Milwaukee), Smith, C. R. (St. Paul), Stagg, F. L. (Madison, Wis.), Stahl, A. J. (La Porte, Ind.), Starks, C. G. (Berlin, Wis.), Stedman, Hiram (Berlin, Wis.), Strong, B. H. (Baraboo, Wis.), Swift, R. A. (Chicago), Thayer, Geo. L. (Belle Plaine, Iowa), Thorp, W. H. (Beaver Dam, Wis.), Trege, Chas. H. (Hoopesston, Ill.), Turner, H. L. (St. Joseph, Mich.), Wakeman, C. J. (Chicago), Whyte, Geo. S. (Chicago)

APPLICATIONS FOR MEMBERSHIP.

Applications for membership were received from A. A. Schlew, Lancaster, Wis.; A. J. Stahl, La Porte, Ind.; W. H. Schott, Chicago, Ill.; George J. Wesborn, Cadillac, Mich.; Hiram Stedman, Berlin, Wis.; Joseph C. Marsden, Beloit, Wis.; Julian Roe, Chicago; Samuel Wilkinson, Northville, Mich.; Charles H. Trege, Hoopesston, Ill.; Siemens & Halske Electric company, Chicago; Tutonia Incandescent Lamp company, Tutonia, O.; Beardtown Electric Light and Plant company, Beardtown, Ill.; W. H. Foster, Geneseo, Ill.; Stillwater Gas and Electric Light company, Stillwater, Minn.; A. C. Gates, Newton, Ia.; Douglas Hoopesston, Ottawa, Ill.; J. C. Wormly, Chicago; H. M. Wilkinson, Atlanta, Ga.; Howard C. Slater, Milwaukee, Wis.; Okonite company, New York, N. Y.; Andrew J. Paul, Boston; Henry W. Friend, Vincennes, Ind.; J. H. Mabbs, Chicago; G. E. Hall, Oshkosh, Wis.; Eagle Grove Electric company, Eagle Grove, Ia.; W. E. Doerley, Big Rapids, Mich.; Pose Manufacturing company, Hartford, Conn.; J. G. Shawn, Viroqua, Wis.; Dearborn Drug and Chemical Works, Chicago.

Convention Notes.

The Sawyer-Man Electric company was represented by Clarence A. Ross of the Chicago office.

Russell A. Willson of Marquette, Mich., was said to have been the only "municipal" man at the convention.

Mr. Pomeroy of McGill & Pomeroy, electric-railway supplies, was there. What was the matter with McGill?

Channing T. Gage, the man so well known throughout Minneapolis and St. Paul, and, in fact, the entire Northwest, was on hand, as usual.

Treasurer and General Manager A. Louis Kuemsted, accompanied by "Lieutenant" Raymond, did the honors for "the electrical bargain house."

"Healy" of the Julius Andrae Sons company was "everywhere." Healy is a good fellow, a hard worker, and he energetically did the honors for Milwaukee and his popular house.

Mr. B. J. Arnold, who addressed the convention on the "Trend of Central-station Design," was compelled, by pressure of business, to return to Chicago before the close of the convention.

Julian Roe represented the Crocker-Wheeler Electric company last year, and this year he followed his usual custom and appeared at the convention. Manager Wilmerding was not in attendance.

Of course the genial representative of the Perkins Electric Switch Manufacturing company of Hartford, Conn., Edward K. Patton, ran up from his Chicago office, and "mixed" with his host of friends.

The John A. Roebing's Sons company, as is customary, appeared in the person of A. B. Conover, Jr. Mr. Conover's convenient combination pocket-book and memorandum-book was much sought after.

The Cass & Aaron company, Chicago, dealer in second-hand electric machinery and repairs, would have found the Northwestern convention a splendid opportunity in which to add to its already long list of friends.

S. M. Hamill of the Brush Electric company of New York often suddenly appears at conventions, as was the case at last year's Northwestern convention, but this time he was absent, leaving Mr. Sunny to do the honors in his stead.

E. Kuhlman of the Kuhlman Electric company of Elkhart, Ind., manufacturer of transformers, was heartily welcomed by his many friends. Mr. Kuhlman is one of the most experienced manufacturers of transformers in the West.

F. Overbagh, manager of the Chicago General Fixture company, did the honors for his institution, and was assisted in his "pink tea" by L. W. Kittman, so well liked as the company's traveling representative throughout the Northwest.

The Dearborn Electric company, Chicago, appeared in the person of Charles Messer. Mr. Messer has not heretofore been a regular attendant at the Northwestern conventions, but it is hoped, now that the start is made, it will not be his last.

It was a matter of great regret to the many friends of the Wagner Electric Manufacturing company that Assistant General Manager W. A. Layman could not have appeared in company with Manager of Sales Abadie and Chicago Manager Foster.

Last year Western Manager Frank H. Clark of the Chicago office of the Electric Storage Battery company of Philadelphia made his debut at a Northwestern convention, and the promptness with which he turned up this time indicates that he knows a good thing when he sees it.

L. W. Burch of the Electrical Supply company of Madison, Wis., was, of course, on hand. Mr. Burch was feeling jubilant over the fact that he had recently secured a very large order for wire and had also recently been able to double the capital stock of his company and have it all paid in.

It has often been said that no electrical convention would be complete without "Senator" George S. Searing, who, it may be stated incidentally, sells Hart switches as a matter of recreation. Mr. Searing's distinguished presence added greatly to the pleasure of the banquet.

Owing to pressure of business at the city hall of Edgewater and also at the western office of the American Electrical Works, Mayor Donohoe was compelled to delegate the pleasant task of attending the Northwestern convention to his energetic representative, Edgar H. Hammond.

Francis Raymond took care of the interests of the Charles E. Gregory company. Someone started the report that Mr. Raymond is shortly to become a benedict. In the event of Mr. Raymond being successful in such an important undertaking, his friends are prepared to show him all the honors.

No man was more warmly welcomed than W. H. Grissom of Monadnock block, Chicago, representing the Eureka Tempered Copper Works of Northeast, Pa. Mr. Grissom is a man who makes a friend at every turn through his unflinching courtesy and consideration of others, and, once made, he never loses him.

M. B. Austin & Co., occupied a parlor near the convention hall and were represented by Messrs. Austin and Browne. This concern's exhibit consisted of Mr. Austin's patent switch that has met with such great success during last year, circuit

breakers and L. A. Chase & Co.'s conduit system. Speaking of conduits of this latter company, calls to mind that Sears B. Condit, Jr., of L. A. Chase & Co., joined forces with Mr. Austin in helping entertain.

Count William Goltz, ex-secretary of the association and well known for so many years in Milwaukee in electrical circles, and within the last year or so secretary of Meysenburg & Badt, came up from Chicago and mingled once more with his Northwestern convention friends and acquaintances in Milwaukee.

Electrical Specialist George Cutter, full of his old tricks, was on hand, and, as usual, warmly welcomed. Mr. Cutter made no exhibit. This is the only thing that can be said to his discredit, as he has of late brought out several most valuable novelties in the line of arc-lighting specialties, and this occasion was the chance of the year.

A. J. Stahl earned the name at this convention of the "hot-water heat" expert. Mr. Stahl knew his business, and gave the practical men of the convention many practical points on economics in the matter of the distribution of heat from the modern electric-lighting central station. Mr. Stahl's headquarters are at La Porte, Ind.

General Manager Fox of the Northern Electrical Manufacturing company sent from Madison a most genial representative in the person of F. L. Stagg. Mr. Stagg is Mr. Fox's right-hand man, and having been in the electrical business for many years and thoroughly acquainted, it is safe to say that Mr. Fox's interests were well looked after.

The Fort Wayne Electric corporation strolled into the convention halls with that usual winning smile for which it is noted in the person of its ubiquitous representative, E. L. Draffen, of the Chicago office. Mr. Draffen brought his smile back to Chicago in an enlarged condition, and it is said there is good reason for his happy mood.

George Patterson of the Chicago office of the Circular Loom company won tremendous applause by the climax of his performance in electric club swinging at the lecture on Wednesday evening. Mr. Patterson produces an electrical performance that has been presented on the stage in both New York and Chicago, winning him an enviable reputation.

Electrical Engineer Knox of No. 700 Fisher building, Chicago, should not have lost the opportunity again to shake the hands of his many friends made at the preceding Northwestern convention. Mr. Knox has recently severed his connection, however, with the Varley Duplex Magnet company, and, with other connections pending, he was unable to spare the time for a gathering that would have given him the greatest pleasure.

When a man comes clear from the hub of the universe to a point on the circumference, like Milwaukee, it is certainly a compliment, and for this reason the sudden appearance of that cultured Bostonian, Sears B. Condit, Jr., manager for L. A. Chase & Co., created something of a sensation among his many warm western friends. Mr. Sears made many new friends at the last National convention in Chicago, and this time he is doubly welcome.

The Library Bureau of No. 215 Madison street, Chicago, through its painstaking representative, Rodger A. Simonson, made a novel exhibit of its card system of records, suitable particularly to the needs of central-station men. Managers who have had trouble devising a system of records for station service found Mr. Simonson's exhibit one of great value, as he literally fills "a long-felt want." Specimen forms of systems in use in New York, Boston and Chicago were exhibited.

It isn't often that so busy a man as Western Manager B. E. Sunny of the General Electric company can spare time to join the detachment he usually dispatches to every convention, but this time he was on hand early and stayed late. Mr. Sunny responded to a toast at the banquet, and made some most pertinent remarks, that may be considered almost in the light of a prophecy relative to the trend of the central-station business the coming year. Mr. Sunny's words made a decided impression.

Jacob Cloos of the Cloos Engineering company had charge of the wiring for the exhibits, and was unflinching in his courtesy and efforts to aid the boys in the hard work necessitated by such hasty preparations. Mr. Cloos has made a reputation for himself with his non-arcing oil-break switch. It has been pronounced one of the innovations of the year and is an invaluable adjunct in any situation where high-tension currents liable to arc and do damage are employed. This device is worthy of the most careful investigation.

Although General Manager Hammer of the Chicago Rheostat company could not find time to be present, as was also the case with Mr. Harding of the same concern, he nevertheless is entitled to the thanks of the association for his courtesy in the loan of a large rheostat as an adjunct in the production of the electrical effects in the lecture at Plymouth Church on Wednesday evening. Mr. Hammer's rheostat, although put together with almost no other data than guesswork, operated with the greatest perfection.

With a rush of wind, the door of the Pfister opened on Thursday evening, and in blew "Clark," that ubiquitous pole dealer whose name constitutes

one of the ornaments in the title of the Valentine-Clark company of Chicago. "Clark" is losing his well-established reputation for absolute veracity through his yearly repetition of his indifference to electrical conventions, that in every instance is disproved by his sudden appearance at every convention at the most opportune moment. Valentine stayed at home to work.

No Northwestern convention is looked upon as complete unless Secretary and Treasurer William M. Smith of the Chicago Insulated Wire company is present. Mr. Smith came up with the Chicago party and remained with the boys through to the end. He made no exhibit, but the product of the Chicago Insulated Wire company is well known to the members of the Northwestern Electrical association, and Mr. Smith merely used this opportunity for renewing old acquaintances and adding new ones to his already long list.

Messrs. William S. Hine and A. McNab Little represented the Western Electric company. Messrs. Hine and Little made no exhibit, but presented interesting printed matter relative to the great variety of Western Electric apparatus. They had bulletins representing alternating lamps and other supplies, to say nothing of the Stanley apparatus, which is Mr. Hine's particular care. In the hands of experienced convention goers entertainment is usually a prominent feature of every exhibit, and Messrs. Hine and Little did their part gracefully.

Messrs. Selumacher and Zamel of the Zamel Arc Light Meter company, Chicago, are two of the most enthusiastic attendants of the Northwestern convention, and turned up as usual. It will be remembered that the Zamel company exhibited on previous occasions a novel arc-light meter, through which the time of burning of arc lamps might be registered, and thus charged to the benefit of the consumer—a device that has proved in practice its efficiency as an aid to the salesman in introducing the arc light into stores where arc lamps are only desired during a portion of the evening.

Manager of Sales E. H. Abadie of the Wagner Electric Manufacturing company of St. Louis received from a competitor during the Northwestern convention a compliment seldom paid, and more valuable from the fact that it did come from a strong competitor. In the presence of several gentlemen, the manager of a branch office of one of the largest electric companies of the United States stated that a contract he had recently seen, and which was drawn up by Mr. Abadie, was such a model in its way that he considered it an advance in the art of contract making.

W. Worth Bean, Jr., in company with H. L. Turner, electrician of the St. Joseph and Benton Harbor Electric Railway and Lighting company of St. Joseph, Mich., came to represent him, who to-day is "the maddest man in Michigan," "Governor Bean." The latter gentleman, as is his usual good fortune, one might almost say, custom, is at present engaged in a slight case of wrestle with someone in his municipality, who is trying to make inroads on his business. It was too bad he couldn't have been in attendance, but he need have no anxiety; the "chip of the old block" knew his business.

The inimitable and ever graceful Western Manager James Wolff, of the New York Insulated Wire company and incidentally chairman of the Northwestern Commission of Transportation, although almost overcome with an attack of the grip, left his bed in order not to miss one of his most pleasant and profitable trips of the year. Messrs. Wolff, Whyte and Low certainly deserve credit for the fine showing of members produced on the special train from Chicago. Incidentally, it may be said that Chairman Wolff made a most graceful response to Secretary Mercein's call for a toast at the banquet.

That man of many friends, Joseph H. Cooke, came to the convention, as usual, to represent his two pets, the Buckeye Electric company and the Jandus Electric company of Cleveland. As is well known, the Jandus company has recently brought out several new types of enclosed arc lamps, and its work in the production of such lamps for alternating and continuous service has been brought to a remarkable state of perfection. Those interested in knowing something of the advances in the art of arc-lamp manufacture will find it profitable to visit Mr. Cooke's Chicago office, No. 753 Monadnock block.

So many bouquets have been deservedly cast at the feet of the silver-tongued secretary, Thomas R. Mercein, that it seems almost superfluous to add to his already luxuriant flower garden. It is gratifying to note that this year the association, without a dissenting voice, doubled the secretary's salary. It seems incongruous almost to speak of salary in connection with a man who has shown himself a genius as an executive in association matters, but this spontaneous action on the part of the association should be taken by Mr. Mercein, as it was meant, as a well-deserved recognition of faithful service.

The remark was made with reference to the Illinois Electric company, "These boys have certainly come to the front." Applying, as it did, however, to this concern's rapid growth into prosperity, it was none the less pertinent relative to the manner in which its hustling representatives "did up" the '99 Northwestern convention. Secretary L. K.

Cushing, Treasurer Carl Keith, backed by those skillful salesmen, H. E. Adams and Dewey Newman, needed no exhibit to demonstrate that the Illinois Electric company was one of the "warm things" of the present day, especially in the western supply business.

President Edgar of the Dearborn Drug and Chemical Works was one of those missed this year at the Northwestern convention. Last year Mr. Edgar read one of the most interesting papers presented at the convention on the treatment of boilers for the prevention of scale. However, Willis D. Jameson, in company with J. M. Frye, nobly did the honors, making an interesting exhibit of specimens of boiler scale, etc., to say nothing of Dearborn perfumes and oils. Vice-president Eddy and "Entertainer" Carr of the Dearborn company made the mistake of the year in failing to slip in, if only for an hour or two.

It is safe to say it was the unanimous opinion of the guests at the Pfister that Manager A. L. Severance of this popular hostelry outdid himself on this occasion in the matter of attending to the comforts of his convention guests and seeing that every courtesy was shown them. Mr. Severance was on hand constantly, in person, always courteous, and doing everything in his power to extend that hospitality for which the Pfister is now noted. It is a very easy matter to prophesy that the next Northwestern convention, a year from date, will be held in no other hotel than the Pfister, which has been repeatedly pronounced an ideal hotel for the convention.

Of course President Willard W. Low of the Electric Appliance company was on hand, and this time his lieutenant was B. B. Downs. Mr. Low was almost ubiquitous, and where he was not traces could still be found in the shape of Appliance buttons, carrying the story of Packard lamps. This little button or charm, as it was called by the company, was said to prevent, if carried in the pocket, bald heads, hard work, love, warts on the nose, bicycle face, dark brown taste, war craze, swelled head, delirium tremens, unhappy marriages, insanity, punctured tires and the purchase of any other apparatus than that sold by the Electric Appliance company. But where was Stacey?

W. R. Pinckard, in company with C. W. Rugg, came up from Chicago to look after the interests of the Westinghouse Electric and Manufacturing company of Pittsburg, Pa. It was unfortunate, however, that these gentlemen could not have been joined by Manager Warren of the company's advertising department. Mr. Warren was one of the most welcome guests at the last midsummer convention on the steamer, and he would have found many old friends had he been able to again appear at Milwaukee. When Mr. Warren himself cannot appear, it has been suggested that he delegate his energetic assistant, "Probasco." The Westinghouse company made no exhibit this time.

Of course the Sprague Electric company was there in full force, and Western Manager E. B. Kittle, in company with Charles G. Burton, who has recently allied himself with this institution, showed the Northwestern people that the Sprague company always means to keep away up in the front ranks. Messrs. Kittle and Burton were on hand every hour in the day, and someone whispered every hour in the night as well. However that may have been, most energetic work was performed, and the artistic stories of these gentlemen relative to the merits of Lundell fans and motors, Sprague elevators and interior conduit will be remembered as gems of electrical salesmanship.

The General Electric company held forth in a room on the parlor floor, as usual, and was represented by F. N. Boyer, J. Scribner, "Tom" Ferris of Milwaukee, R. A. Swain and F. W. Wilcox. The General Electric company did not make any display other than an introduction of a new line of small single-phase induction motors and the two-rate wattmeter. The latter instrument places the central-station manager in possession of the amount of current consumed by his customer at any period of the run, and enables him to do justice to his customers on charges between the peak and valley of his load. The usual line of printed matter was on tap, with some excellent new publications on arc lamps, meters, transformers and supplies.

When a supply house as far south as the Commercial Electrical Supply company of St. Louis sends a man to Milwaukee, no better illustration than such a proceeding can be found of the far-reaching nature of the company's business. James B. O'Brien did the honors for the Commercial company, and did them in his usual inimitable manner. The Commercial Electrical Supply company is now often referred to as the emporium of electrical supplies, and, owing to the comprehensive nature of the company's business, the question is often asked why President Joseph Franklin, Jr., and Manager of Sales Paul D. Cable haven't sometimes taken this opportunity to steal northward on a little "business trip" that would not be unflavored with pleasure.

Electrical Engineer Adolph Hamaeck of the Sturgeon Bay, Wis., electric-light plant, surprised the convention with a new arc lamp of most novel and simple construction. The lamp was of the enclosed-arc type for alternating current, and one of its features was its shortness, being only 18 inches long. It has a direct carbon feed; that is, it is without

a carbon rod, and it also has no side rod extending down outside of the globe enclosing the arc. Mr. Hamaeck states that his lamp burns from 75 to 125 hours on one trimming, consuming a 12-inch upper and a five-inch lower half-inch carbon. Mr. Hamaeck expects to organize a company to exploit this new lamp, as he has had already a most surprising demand for it to an extent which necessitates a greatly increased capital.

"Colonel" George Rex did the honors for the Columbia Incandescent Lamp company of St. Louis. As is well known, Mr. Rex is the manager of this company's Chicago office. Mr. Rex made one great mistake in his otherwise successful effort to make the most attractive possible display for his company. The one stone he left unturned, so to speak, was his failure to induce Secretary Arthur Garrison of the Columbia company to follow his time-honored custom of appearing at the Northwestern conventions. Mr. Garrison has recently become a benedict, but, of course, his excuse for this unpardonable failure would be "too busy at the factory," and undoubtedly the statement is correct, for it is said that the Columbia company is having a phenomenal rush of business. The trademark "unequaled in quality," backed by the company's honest endeavor, seems to be paying.

A most interesting novelty and one that attracted no little attention on the part of economically inclined central-station men was the wire re-insulating machine of Lewis & Buchl of Sycamore, Ill., exhibited by Everett L. Palmer. This was Mr. Palmer's initial appearance at the electrical conventions, but it did not take him long to prominently locate his machine in one of the parlors. In practical operation the machine illustrated the manner in which old and poorly insulated lighting or other electrical conductors can be re-insulated, and thus saved from being stripped from the pole. Mr. Palmer distributed a neat little circular, which told the reader "how to save your insulated wire." Practical men at the convention told Mr. Palmer that he had a winner and a seller and a device that would likely be in the hands of every electric-light man with an appreciation of high insulation.

Martin J. Insull, manufacturers' agent, Chicago, made his initial bow in this capacity at a Northwestern convention, and his debut won him favor, for his exhibit of the Wright demand meter created more or less of a sensation among the central-station managers. It was a curiosity, in a way, except that many had already been posted relative to its advantages, but, nevertheless, the practical exhibition of its merits, through the agency of a sample exhibited, proved it beyond doubt to be a most meritorious invention, and demonstrated that Mr. Insull knows his business as a manufacturers' agent. Mr. Insull was assisted in his work of entertainment and exhibition by Thomas James and Charles D. Heile, the latter gentleman attending particularly to the business of the Wright Discount Meter company. One specialty in the Insull exhibit that met with particular attention was the type "K" transformer of the Pittsburg Transformer company, the agency for which Mr. Insull has recently accepted.

As has been its custom at every convention, whether National, street-railway, telephone or Northwestern, the Central Electric company sent a noble phalanx of representatives to remind people of the "old and reliable house" that has recently issued the "greatest encyclopaedia of electrical supplies of the nineteenth century." President George A. McKinlock, as was the case last year, was prevented from attending by pressure of business, but Secretary Charles E. Brown ran up for a day to catch a glimpse of the boys. Mr. Brown left the company's display in the hands of his two popular representatives, F. M. Pierce and C. W. Cobb. The Zeco arc lamp was the one specialty paid particular attention; this lamp is meeting with great success, owing to its many valuable qualities, chief among which is its extreme simplicity and very simple but very novel clutch. According to President McKinlock, the demand for this lamp has been so great that the company has recently had to secure a very large stock, so that orders could be promptly filled.

E. L. Barr represented the Wallace Electric company of Chicago, and in company with Leo Keller of Shoeman & Keller, talked "Chicago" arc lamps. Shoeman & Keller are general distributing agents for the Chicago incandescent arc lamp, and the Wallace Electric company is acting as sales agent likewise for this lamp. One of the features of the Chicago lamp is its simplicity; no springs, no gears, no ratchets, no chain feed; in fact, nothing to adjust or get out of order. The claim is made that this lamp is the best enclosed arc lamp on the market for direct current, and many good reasons are given for this assertion. The present occasion was Mr. Keller's first appearance, and he proved himself a "good fellow" in every sense of the word and made many friends. He will meet with the warmest welcome at the next convention, especially from the fact that it is rumored that he is a talented entertainer and his stories are inimitable. Mr. Barr, in addition to his other duties, did most energetic work for that old standby of the Wallace Electric company, the Eddy Electric Manufacturing company.

The Victor Telephone company of Chicago distinguished itself for enterprise in being the only telephone company this year to present its apparatus at this notable northwestern electrical gathering.

one of the ornaments in the title of the Valentine-General Manager William T. Blaine, accompanied by A. J. Rousseau, engaged one of the best located parlors in "exhibition row," and there presented for the inspection of the electrical experts as fine specimens of telephonic instrument work as, it is safe to say, are on the market. A 200-drop capacity metallic switchboard was shown, also a full line of desk 'phones, wall sets and general switchboard apparatus. Mr. Blaine is an old newspaper man, and showed his talents as an entertainer by the rapid manner in which he made friends with those at the convention. The Victor Telephone company, although starting hardly a year ago, has made such rapid progress and met with such phenomenal success, that the already large factory on Clinton street, Chicago, has had to be extended. An inspection of a section of the Victor switchboard shows instantly the reason for the company's rapid stride forward. Anyone versed in machinery will instantly see that Mr. Blaine's motto has been to present the very highest grade of workmanship.

Secretary George S. Whyte of the Leschen-Macomber-Whyte company was one of the trio, the other two members of which were James Wolff and Willard Low, that constituted and carried to such a successful termination the Chicago transportation arrangements. Mr. Whyte, as was naturally expected, owing to his energetic nature and host of friends, did noble work in the matter of bringing together delegates for the special train from Chicago. A man is never a prophet in his own country, though, and in spite of his influence among the boys, he failed most signally in his own bailiwick, for many were the inquiries for Macomber, who, it will be remembered, made his initiatory bow at electrical conventions with much grace at the street-railway gathering in Boston last fall. The Leschen-Macomber-Whyte company makes quite a specialty of furnishing guy ropes and other wire goods, to say nothing of iron, steel and copper wire, bare and insulated, suitable for electric-light service and especially to the needs of telephone work. The last-named branch of the company's business has greatly increased of late, due, no doubt, to the popularity of this company's goods and its representatives among the independent telephone exchanges.

New "Interrupted-current" Dynamo.

A new and interesting type of dynamo, claimed to be of remarkable efficiency, has been brought out

connected through a special commutator to separate distributing circuits with a common return, as shown in the accompanying diagram (Fig. 1). The initial voltage generated in each circuit is 220 volts. This current is generated in each circuit for only one-third of the time, or, in other words, each coil on the armature is active for only one-third of a revolution, being entirely cut out of circuit for the remaining two-thirds. Actual test has demonstrated that when a rate of 5,400 impulses a minute has been reached the light is absolutely steady.

A recent test of a 300-light machine of this type was made in the following manner: Two new 16 candle power, 110-volt, 55-watt lamps were selected at random from a barrel of Buckeye lamps. These were placed at each end of a Bunson photometer. One was connected to the mains of a direct-current machine and held at 115 volts; the other was connected with the dynamo being tested. The Bunson disk was placed in the center of the scale and the current from the dynamo under test was regu-

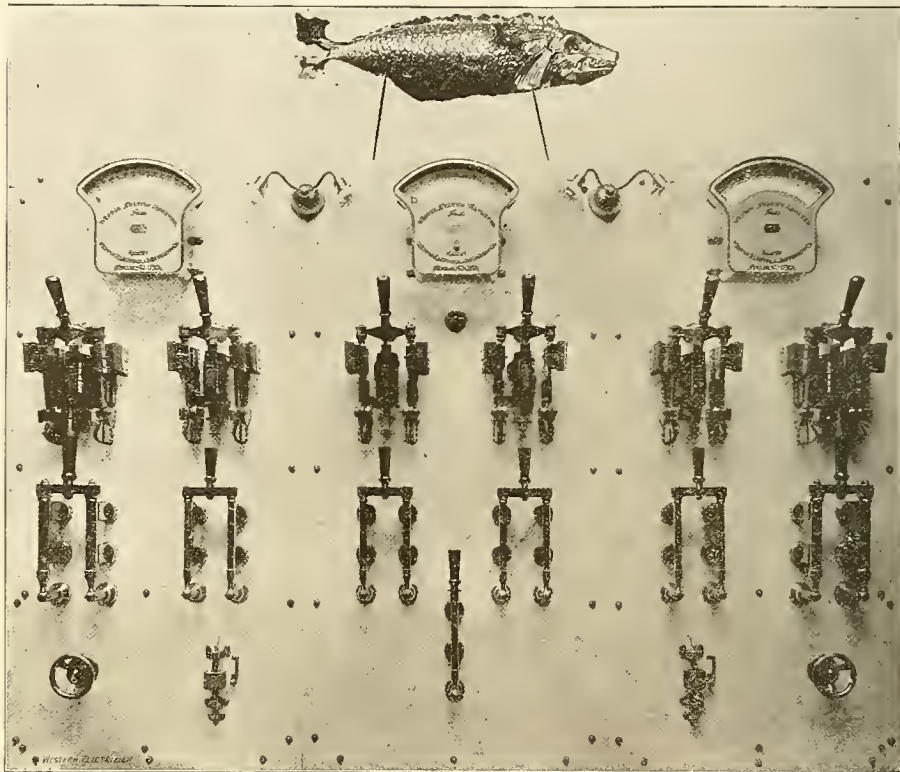
As will be noticed from Fig. 2, the machine is simple and compact. The results obtained, while remarkable, can be, it is said, demonstrated to be correct theoretically, and the record of the machine itself furnishes the corroboration of the theory.

The Triumph company thinks that this machine opens a new era in incandescent lighting and that, on the present close margin of profits, no consumer can afford to overlook this opportunity of cutting down his fuel account. The manufacturer states that it is ready to furnish a limited number of sizes at present and to put them in on trial, permitting the machine to make its own record.

Fish Brothers' Switchboard.

The cut presented herewith illustrates an artistic switchboard that has just been built for the Fish Brothers Wagon company of Racine, Wis., by Julius Andrae & Sons company.

The Fish Brothers Wagon company is one of



FISH BROTHERS' SWITCHBOARD.

lated with a field rheostat until the lamp on that circuit was brought to the same candle power as that on the direct current. All readings were taken with Weston portable voltmeters. When the candle power of the lamp on what may be called the 'interrupted-current' generator was exactly the same as that on the direct current the apparent voltage of the interrupted current was observed and the test began, the results being given below. The dy-

of the largest concerns of its kind in the United States, and recently it decided to make the addition to its factory of an electric power station, including a new engine room and new engine; in fact, the company has put in an entirely new electric equipment and is installing motors up to 50 horse power to drive the machinery of the factory. There will be in the entire installation about 20 Northern Electrical Manufacturing company's motors. In the power house there will be three generators, one Rockford dynamo for lighting service alone, and two Northern company's power generators of 125 kilowatts each.

The plant was sold by J. S. Healey of the Julius Andrae & Sons company of Milwaukee and the switchboard was put up by the Andraes especially for this plant. This board is equipped with three Weston illuminated instruments—two voltmeters and one ammeter. There are also six "I-T-E" circuit breakers made by the Cutter Electrical Manufacturing company of Philadelphia, also six Crouse-Hinds tubular switches, quick-break. In addition, at the base of the board are two Cutler-Hammer rheostats and two Garton-Daniels lightning arresters. The metallic portions of the board, switches, instruments, etc., showing on its face, are all finished in red burnished copper, and as the board proper is of Italian marble, this combination of marble and copper gives it a most artistic finish. The board is surmounted by a red copper fish, the eyes of which, when the board is in operation, will be illuminated by two tiny incandescent lamp bulbs. The entire board is raised 18 inches from the floor on two highly ornamented red-copper pedestals.

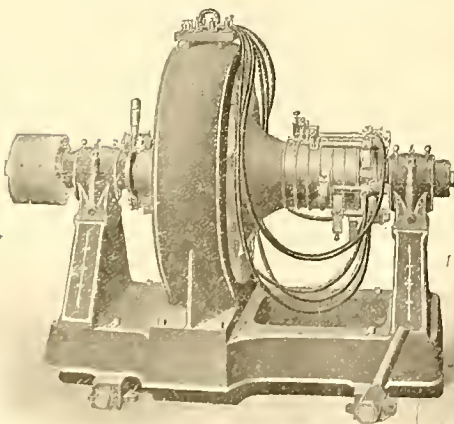


FIG. 2.

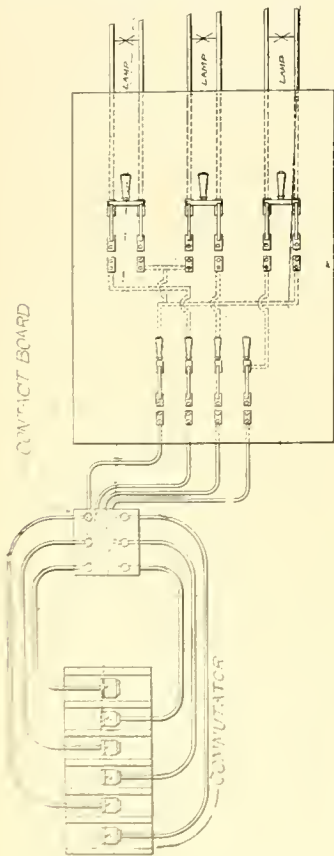


FIG. 1.

NEW "INTERRUPTED-CURRENT" DYNAMO.

The Triumph Electric company of Cincinnati, O. This dynamo, the maker claims, will develop current 50 per cent. more light than the most modern efficient machine of the usual design for the same rated capacity, or, vice versa, will develop more for the same number of lights with the expenditure of only 25 per cent. of the energy required by other machines.

As compared with the dynamo to that of Corli in the same field the result being obtained by using the direct-current dynamo, 50 to 100 per cent. more light per ampere, the armature windings being divided into distinct and separate cir-

cular dynamo was belted to a countershaft driven by a 12 by 14 automatic engine.

Average of three cards, 33.35 horse power; number of 16 candle power lamps, 394.

Average of three cards, 21.43 horse power; number of 16 candle power lamps, 152.

Average of three cards, 13.82 horse power; fields open.

Number of 16 candle power lamps per horse power delivered at full load, 15.66.

Number of 16 candle power lamps per horse power delivered at half load, 11.32.

It will be observed that these results are fully 50 per cent. better than can be expected from any standard machine of the same capacity; also that there is a surprisingly small drop in efficiency at half load.

Writing from Santiago de Cuba, a correspondent of the Chicago Record says: "Santiago has no means of street traffic save by ancient carriages or hacks, and a street railway undoubtedly would be a paying institution. The climatic influences are such as to make the inhabitants lazy, no matter whether they have lived here long or not, and they all detest walking. It costs \$1 to ride in a carriage to any part of the city, no matter if the distance is one block or 20 blocks. On account of the hills and the hot climate a street railway would necessarily have to be operated by electricity or other mechanical power, as it would be impossible for mules or horses to pull the cars up the grades."

Reliable Telephone Apparatus.

The accompanying illustrations show the apparatus and mechanical details of the Reliable Electric Manufacturing company of Worcester, Mass. Fig. 1 shows the transmitter which has been perfected in this company's shops. Its construction will be readily seen by a careful study of the picture. It is composed of two carbon plates, one being adjustably mounted in the transmitter casing and the carbon-contact plate being fastened on a thin metal plate and riveted on the diaphragm, leaving a clearance of one-sixteenth of an inch between the carbon plate and the diaphragm, in order to make the whole surface of the diaphragm sensitive to vibrations. The casing is preferably mounted in a suitable socket, so that it can be turned round from time to time, in order to prevent the carbon grains from packing together. An annular felt washer is mounted upon the carbon plate so as to confine a body of powdered or granulated carbon between the carbon plates.

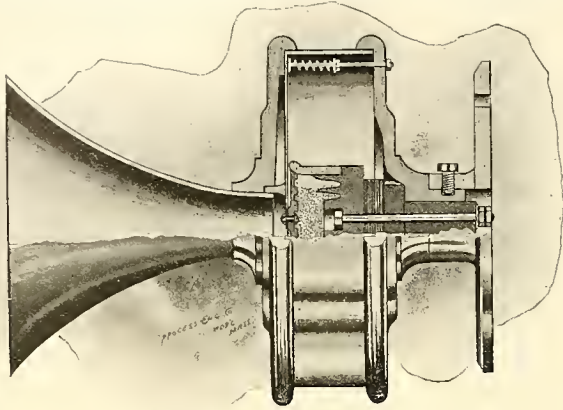


Fig. 1. Transmitter.

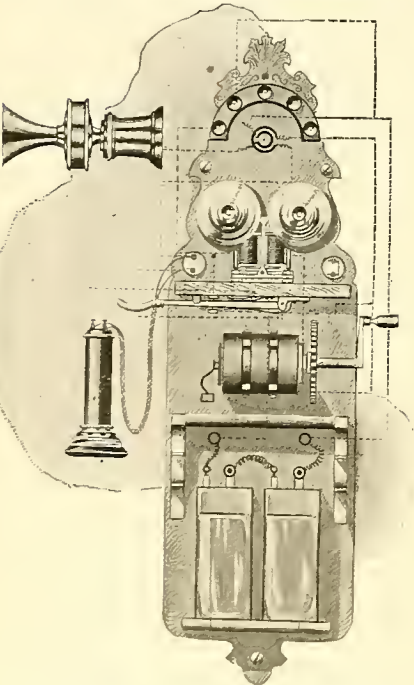


Fig. 2. Mechanical Construction of Exchange Telephone.

RELIABLE TELEPHONE APPARATUS.

At the outer end, the annular felt washer engages a chamfered or inclined edge on the carbon plate, this construction being especially adapted to give a half-sliding, half-compressing motion of the felt washer in order to reduce the friction to the minimum. By providing the carbon-contact plates with a serrated or roughened face, an increased area of contact is secured between the carbon grains and the contact plates, so that the vibration of one of the plates will cause a considerable variation in the resistance to the electric current; also, on account of this construction, there will be less liability of the powdered carbon caking or hardening.

In the other telephones the same form of transmitter is adopted. Fig. 2 shows the mechanical construction of the instrument designed by this company for exchange and long-distance service. It will be observed that it is rather unlike many of the standard market telephones for exchange instruments. The aim of the designer in perfecting this character of telephone apparatus has been to reach a higher degree of perfection in mechanical construction than has heretofore been obtained.

Fig. 3 shows the combination transmitter and receiver which is being made for use, either with the apparatus manufactured by this company, or to be applied to instruments of other make.

Fig. 4 shows the desk or movable instrument. This is a well-finished piece of apparatus, made in

polished nickel and carefully constructed as to mechanical and electrical features.

CORRESPONDENCE.

New York Notes.

New York, January 23.—The Manhattan Railway company and its property occupied a large share of public attention last week. On Tuesday Mr. W. J. Fransioli resigned his position as general manager, after 18 years' service with the company, to go with Richard Croker's auto-truck company. Alfred Skitt, the lately appointed vice-president of the Manhattan company, will assume the duties of general manager. Later came vague rumors of a possible consolidation of the Manhattan, Metropolitan and Third Avenue railway interests, but these startling reports could be traced to no authoritative source. Then came renewed talk of the electrical equipment

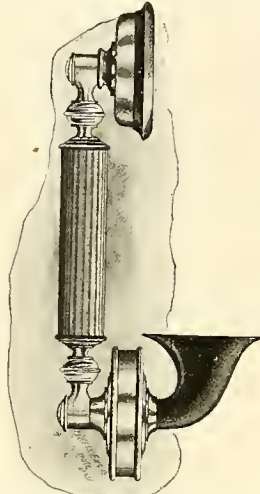


Fig. 3. Combination Transmitter and Receiver.

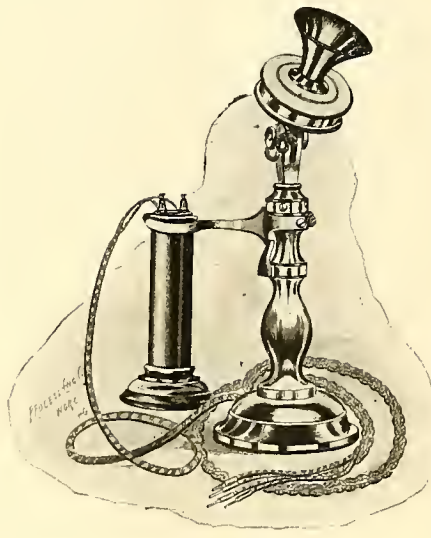


Fig. 4. Desk Telephone Set.

of the Manhattan elevated system. All the time the stock was going up on Wall street by leaps and bounds. But this was not as remarkable as it would have been at another time, as the week was one of extraordinary "boom" on the stock exchange, and almost every well-recognized trading stock advanced. One report was that the Vanderbilts had purchased large holdings of the stock, but this was promptly denied by Senator Depew. Then it was rumored that the Westinghouse company had secured the contract to equip the road for electrical operation, but Mr. Russell Sage denies this, and asserts that while the company is considering the possibility of electrical operation, it is proceeding very cautiously and nothing has been done. Mr. Sage is quoted by the *Sun* of yesterday as talking freely about the situation, and I will quote here a portion of the interesting interview. You will see that the venerable capitalist is uncertain about electricity, but has a good word to say for compressed air.

We had a meeting of the board, at which Mr. Westinghouse made an estimate of the cost of equipping the road with electricity. We all agreed that the estimated cost was too high, and Mr. Gould asked if he could get an expert of his from the Union Pacific to study the question. We said he could—it was unanimous. The expert is still at work, and we have a committee of the board looking into the matter. We have had several meetings of the board to talk the thing over and we're still at work on it.

You see, we don't want to expend eight to fifteen million dollars on this thing unless we know just what we're going to get. Now, Westinghouse is an expert and a friend of mine, and he ought to

know something about it, but he isn't very sure about the thing. Four years ago he came to me and said we could save \$600,000 a year by using electricity—and \$600,000 a year is tempting. I asked him to look into it. He kept me waiting a couple of years and then he was so sure about it.

"Hold on to your steam for a while," he said. So, you see, there's nothing sure about this. I don't know anything about electricity, and they all seem a little in the dark about it. You see a man climb a pole, and the next thing he comes down flop—dead. We run trains under two minutes' headway in the rush hours on Third Avenue and under two minutes' headway on Sixth Avenue, and we carry 500,000 people a day. We can't have any delays or accidents. I am proud of the fact that we have never killed a passenger, and with some new arrangements, if two trains should run into each other fifty people might be killed and that might bankrupt the road.

Out in Chicago, Mr. Gould tells me—I've never seen it—they are running trains on the elevated by electricity, but they don't run such heavy cars or such long trains as we do. Of course, they don't carry so many passengers.

[Mr. Sage was asked by the reporter if the company was still looking into air power.]

Oh, of course, we're looking at the thing from all sides. Now, up at 125th street, they've been running an air-power car and an electric car for quite a while. I haven't been up there, but they say they run all right. The air-power car makes more noise, though. This air power is coming up again, and out West, they tell me, they think air power's the only thing.

Lieutenant S. Dana Greene of the General Electric company is scheduled to present a paper on "Electricity on Board Ship" before the American Institute of Electrical Engineers on Wednesday evening. This is a popular subject nowadays and should draw a good attendance.

Mr. Croker's auto-truck company has been organized. The stock of the company was increased to \$10,000,000. The following-named officers were elected: Joseph H. Hoadley, president; Louis Nixon, vice-president; Nathan Straus, treasurer; C. C. Hardy, secretary; Augustus Van Wyck, general counsel; and, as directors, J. H. Hoadley, Arthur P. Gorman, Nathan Straus, Louis Nixon, Richard Croker and Robert J. McKinstry of Philadelphia. The project of the company is to do a general trucking and freight-transportation business in the city of New York and throughout New Jersey. The general counsel for the company is the late Democratic candidate for governor of the state. An obstacle in the path of the company has arisen in the person of Mr. W. E. Prall, who says that he is the inventor of the devices for using compressed air which the new company proposes to use. Mr. Croker says that the company will go ahead with its plans, regardless of Mr. Prall.

The New York Gas and Electric Light, Heat and Power company, "the \$25,000,000 company," is absorbing the Edison Electric Illuminating company with the aid of several prominent financial concerns. Mr. George Foster Peabody, representing the principal stockholders of the Edison company, has entered into an agreement with the State Trust company for the sale of the Edison stock represented by him, to become binding only in case the holders of at least 55 per cent. of the stock shall have agreed to the sale by February 15th, with an allowance of 10 days additional to stockholders living abroad. Up to these dates all stockholders will be privileged to join in the sale on the same terms. These terms fix a valuation of 220 on the Edison stock, payable in four per cent. purchase-money gold bonds, due February 1, 1949, of the New York Gas and Electric Light, Heat and Power company at par; that company to have the right to pay off the bonds at par and accrued interest at any time within three years from February 1, 1899. The bonds may be exchanged for cash at a valuation of 85 and accrued interest at any time before March 25th by Edison stockholders who do not desire to hold them. The bond issue is limited to \$21,000,000. There seems to be no doubt that the sale will be made. The *Sun* is authority for the statement that R. R. Bowker, first vice-president of the Edison company, was opposed to the negotiations for the transfer and has sent in his resignation. Mr. Bowker will also resign, it is added, as president of the Manhattan Electric Light company, which is controlled by the Edison Electric Illuminating company. The outstanding capital stock of the Edison Electric Illuminating company is \$9,200,000. There are also outstanding \$4,312,000 in first-mortgage bonds and \$2,188,000 in first consolidated mortgage bonds. According to the plans of the new company, it is proposed that it shall use the "surplus" electricity from the new power plant of the Metropolitan Street Railway company.

It is rumored that the Brooklyn Rapid Transit company, having now secured control of the Nassau Electric company, will soon succeed in acquiring the Coney Island and Brooklyn company, the only remaining surface trolley system, and follow up this deal by either leasing or purchasing the two elevated roads. The Flower syndicate, it is said, eventually aims to accomplish the consolidation of all the Brooklyn transportation companies and to operate them as one system. The plan contemplates the formation of a new company to purchase all these properties and pay for them partly in bonds and partly in the stock of the new corporation. M. S.

PERSONAL.

John Kean, the senator-elect from New Jersey, holds the principal interest in the Elizabeth Street Railway company.

Richard Croker, Jr., and Frank H. Croker, sons of the Tammany chieftain, are at work now in the Westinghouse Electric shops near Pittsburg. They are taking a course in practical electrical engineering. After they have finished they will enter on the study of law. They are yet a little undecided as to

what profession to follow, but say that both electricity and law are good things to understand.

Mr. C. C. Warren of Sandusky, O., was in Chicago last week. Mr. Warren anticipates a boom in the electrical business, and he believes the next year will show a revival that will recall the early days of electric lighting.

Henry C. Payne of Milwaukee, who returned from a trip to Washington on January 20th, fell in an epileptic fit at the Milwaukee Club and was removed to his home. Mr. Payne has suffered from similar attacks several times within the last year or two, and he has been warned by his physicians to avoid excitement and overwork.

A current newspaper paragraph describes Rossington Elms of St. Louis, 77 years old, as the first messenger boy in St. Louis. He is said to be the oldest telegrapher in America. He is oldest in service of all the employes of the Western Union Telegraph company in the United States. He has served in every position in the telegraph office, beginning as a messenger and advancing to the offices of manager and superintendent. He has been an employe of the Western Union and its predecessors just 50 years.

ELECTRIC LIGHTING.

Santiago, Cuba, boasts an electric-light plant, but the streets are nevertheless very poorly lighted by kerosene lamps.

At Sherman, Chautauqua County, N. Y., the Sherman Electric Light company has been organized. The company has a capital stock of \$5,000. One of the directors is Charles E. Cobb.

The Astoria (N. Y.) Light, Heat and Power company, with its principal office in New York city, has been incorporated with a capital of \$500,000. The company will supply both gas and electricity, and will operate in the several counties comprised in New York city. The directors are Horace W. Fuller, Augustus R. Moen, Arthur C. Hume and F. R. Foraker of Manhattan and T. Wilbur Spear of Brooklyn. It is believed that John D. Crimmins is interested in this company.

The St. Joseph and Benton Harbor (Mich.) Railway and Light company has secured the contract to light and heat the court-house and jail at St. Joseph for three years for \$3,000. The county paid over \$6,000 for the years 1896, 1897 and 1898. This is a blow to municipal ownership. The building committee refused to give W. Worth Bean, president of the company named, the contract in former years. Mr. Bean followed the Board of Supervisors up every year and got the contract by comparing actual results. The figures were taken from the supervisors' reports. The citizens are pleased by the saving to the county.

ELECTRIC RAILWAYS.

It is said that a party of surveyors has been at work for some time in surveying a proposed electric-railroad route from Phoenix, Ariz., to the Arizona Falls and other points of interest on the Arizona Canal. The scheme is projected by the Arizona Water company. The electricity to operate the new line will be generated at the falls.

It is reported that New York financiers have secured options on all street-car systems of St. Louis except the Suburban. Brown Brothers, bankers, are said to have organized the deal. The Central Traction company's franchise, under which street cars can be operated over all existing lines, has been obtained, it is said, by those interested in the syndicate.

The Westinghouse Electric and Manufacturing company has the news that its newly organized French Westinghouse company has the contract for the equipment of the Paris Metropolitan railway with the underground-conductor system. Two or three German companies and various American electrical companies were competitors for the contract. The apparatus will be made at the company's works at Havre.

The street-car company owning the lines in Rockford, Ill., has projected a new line to Belvidere, by the way of Blackhawk Springs. The latter is a summer resort. It is claimed that the Rockford company has the plans perfected to build the road in the spring. At present the Chicago and Northwestern is the only road between Rockford and Belvidere. One of the arguments in favor of the building of the road is that a large number of the hands employed in Belvidere factories reside in Rockford and travel back and forth to and from their work.

The Trenton and Princeton Traction company has been incorporated with a capitalization of \$200,000 to build an electric railroad between Trenton and Princeton, N. J., nine miles distant. The incorporators are ex-Senator George O. Vanderbilt of Princeton, Charles W. Shipper of Boston, and Julius Garst, Elmer E. Carpenter and Henry Lincoln, all of Worcester, Mass. The sum of \$5,000 has been paid in, and Mr. Vanderbilt says the right-of-way has been procured over private lands. The Trenton Traction company and the New York and Philadelphia Traction company have contemplated

building a road to Princeton, but had been deterred by the opposition that came from the university authorities, who do not care to make it any easier for students to get to and from Trenton.

PUBLICATIONS.

The illustrated catalogue and price-list of the Ohio Electric Works of Cleveland, O., for 1899, is just out. This company is well known for its business in electrical novelties for popular use, in the way of bicycle, carriage and necktie lights, batteries and induction coils for medical use, small motors, etc. Doubtless there will be a wide demand for the new catalogue.

A handsome catalogue, with a warm red cover, has just been issued by the Columbia Incandescent Lamp company of St. Louis. It is mainly devoted to well-executed, full-sized half-tone illustrations of the several types of lamps made by the company and will be of value to consumers. The Columbia lamps have a fine reputation, and the company says that its prices are now as low as any it has ever had in effect.

The Simplex Electrical company of Boston has an electric heating department, being the sole manufacturer under the patents of the American Electric Heating corporation. It has issued a neatly printed and well illustrated pamphlet giving particulars of the large number of electric heating and cooking appliances it manufactures, as well as interesting general information on the subject. This is the latest publication on this very attractive branch of the electrical business, and it will doubtless be in demand from engineers, station managers and that portion of the public which desires to surround itself with end-of-the-century conveniences.

Rand, McNally & Co. of Chicago announce the early issue of the 1899 edition of their "Business Atlas and Shippers' Guide" (29th volume), a work that should be of great assistance to all houses with traveling salesmen or shipping departments. This book will contain large scale maps of every state and territory, each Canadian province, Mexico, Central America, special maps of Cuba, Porto Rico, Hawaii, Philippine Islands, and a general map of each continent. The indexed matter covers about all the information necessary for systematic routing and shipping. An alphabetical index shows towns, populations, express offices, money-order offices, etc. A remarkable instance of how a new railroad might affect the expenses of a business house is shown by the completion of the Pecos Valley and Northwestern railway from Pecos, Texas, to Amarillo, Texas, via Roswell, N. M. This new line of 365 miles is a direct connection between points on the Texas and Pacific and Fort Worth and Denver City railways. The failure of an old book to show it might cause an unnecessary trip of over 800 miles, as that would be the distance traveled according to old maps. The new territory opened by this line must also be of interest to commercial houses. The publishers announce that there are annually many thousand changes in the indexed matter and maps, and it would therefore seem that their advice to business men to purchase a new book annually is founded on reasons other than the mere profit on the increased sales of the book. The binding is in substantial canvas, with an index printed in red figures on the front cover.

ELECTRICAL SECURITIES.

The New York and Queens County Railroad company reports for the quarter ended December 31st: Gross earnings, \$86,919; operating expenses, \$58,403; fixed charges, \$65,813, leaving a deficit of \$39,294.

The Albany Railway company reports for the quarter ended December 31st: Gross earnings, \$167,177; operating expenses, \$105,271; fixed charges, \$26,246; balance, \$36,048; an increase of \$4,940. The general balance sheet as of December 31, 1898, shows cash on hand \$56,562 and a profit-and-loss surplus of \$74,470.

It is "authoritatively" stated in Boston that the General Electric company is receiving more than sufficient interest on the securities in its treasury to pay its debenture bond interest and preferred stock dividends. This leaves the entire manufacturing profit for the common stock. It is added that the company is now earning at the rate of 15 per cent. on its common stock.

The Dry Dock, East Broadway and Battery Railroad company of New York reports for the quarter ended December 31, 1898, gross earnings, \$159,713; operating expenses, \$114,857; fixed charges, \$32,686; net income, \$12,607; a decrease of \$13,546, as compared with the same period the year before. The general balance sheet as of December 31, 1898, shows cash on hand \$4,436 and a profit-and-loss surplus of \$18,793.

The board of directors of the Brooklyn Rapid Transit company has called a special meeting of the stockholders for February 11th to vote on the proposition to increase the capital stock of the company from \$20,000,000 to \$45,000,000. It is understood that \$8,000,000 to \$10,000,000 of the new stock will be utilized in completing the Nassau purchase, while the remainder will be held in the treasury of the Rapid Transit company for contingencies, including the ultimate absorption of the elevated roads of Brooklyn.

MISCELLANEOUS.

It is reported that Joseph Leiter will organize a compressed-air auto-truck company in Chicago. It is said that Mr. Leiter has already secured options on land in one of the large manufacturing suburbs, with ample switching facilities on the Belt Line, and will at once begin the erection of an extensive plant for the manufacture of the new motors, the patent rights of which he controls.

The Allan Line steamer Sardinian arrived in Portland, Me., on January 18th, from Liverpool, after a 17-day passage, during which she encountered tempestuous weather. During an electric storm on Tuesday, January 10th, about 5:30 a. m., the crew was awakened by a terrific explosion, which shook the steamer from stem to stern and threw some of the men from their bunks. A huge ball of fire had burst only a few feet above the steamer, and had distributed innumerable smaller ones along the rails and masts. The officer on the bridge was blinded and half-stunned by the explosion and flash, and was thrown violently off his feet.

TRADE NEWS.

A telephone a little better than anything else on the market is a pretty hard thing to build, but the Electric Appliance company claims that it has succeeded in doing this in its No. 11 instrument. It is backing its claims with a liberal offer, which telephone companies are asked to investigate.

The Emerson Electric Manufacturing company of St. Louis received, a few days ago, an order from China for a number of desk and ceiling fans, amounting to about \$1,300, and the next day an order for a quantity of alternating-current ceiling fans, which were to be shipped to South America, amounting to about \$675. In addition to these orders the demand is unusually active from the larger cities in the United States.

The annual election of officers for the Columbia Incandescent Lamp company of St. Louis resulted as follows: President, W. O. Garrison; vice-president and treasurer, A. C. Garrison; acting secretary, George P. Rex. Mr. Rex returns to St. Louis to assist in the routine work of the office. Mr. W. O. Garrison will continue to serve in an advisory, rather than in an active capacity, while the actual management of the company will continue in the able hands of Mr. A. C. Garrison.

Among the latest calendars received is that of the Laclede Battery company of Kokomo, Ind. It is artistic in design and execution, and contains no advertising matter whatever—unless, indeed, the inscription, "Compliments of the Laclede Battery company, Kokomo, Ind.," in the upper left-hand corner may come under that name. An etching by Peter Moran, entitled "Stacking Time," occupies the central position. Underneath is fastened the bunch of 12 small tickets, each representing a month. The calendar is bound to occupy a conspicuous place wherever beauty and utility are appreciated.

To form the connecting link between engineers and technical men generally and the good positions that they should fill is the object of the new Technical Agency, 1365 Monadnock block, Chicago. The agency undertakes, upon the shortest possible notice, to furnish manufacturers, consulting engineers or others with civil, mechanical, electrical, chemical or mining engineers, draughtsmen, electricians and, in fact, competent assistants for any line of engineering work. The names of these men, with complete records, copies of recommendations, etc., are filed under separate headings, and the employer can be supplied with complete statements of the ability and experience of any number of men who are qualified to undertake a particular branch of engineering work. The revenues of the company are derived from a small fee charged to the applicant, to cover cost of filing papers and conducting necessary correspondence, etc., and a commission on his salary when the position is secured. To the employer there is absolutely no charge. Without trouble and without expense he is supplied with a list of carefully selected experts in any particular line—a list which would cost him a large amount of time, effort and expense to duplicate by any other method. It is said that the manufacturers who have availed themselves of the Technical Agency's facilities express themselves well satisfied with the company's methods.

BUSINESS.

William Roche's electric horseshoe pin is having a large sale. It is claimed to be the first of its kind to be operated with a dry cell, thus avoiding the danger of the old acid wet cell. Mr. Roche says that the cell (No. 4 vest-pocket) is capable of giving at least 1,500 flashes before being run down, and is then a good cell for bell-testing, etc.

The United States polishes manufactured by G. W. Hoffman of Indianapolis seem to be filling a place in the electrical trade, several of the larger concerns using these goods exclusively. A special powdered polish is made by this concern for use on arc-lamp parts, where absolute cleanliness and brightness are required. It is said to be indispensable about the dynamo and engine room, where pride

is taken in the metal finishing. A trial sample of the polish will be sent to anyone enclosing a two-cent stamp and stating the class of work to be polished.

Varney & McQuat of Indianapolis, manufacturers and dealers in electrical supplies, have just moved into a new store, and are now located at 125 Meridian street, in much larger and more desirable quarters. They are now located in the heart of the wholesale district. This is the second move of this firm in the last two years, and it is made to enable it to take proper care of its rapidly increasing business. It has more than trebled its supply space and has put in a complete repair department, and is now prepared to accept and turn out all manner of electrical repair work, the refilling of commutators, rewinding of armatures, etc.

As is now quite generally known throughout the Northwest the Julius Andrae & Sons company handles the Ericsson telephone apparatus that is sold under the trademark "Standard of the World."

Since the Andrae company secured this agency these telephones have been introduced throughout its territory. The Julius Andrae & Sons company was established as far back as 1866 and incorporated in 1895, and the name has been synonymous throughout the Northwest for years with the highest class of electrical work. Julius Andrae & Sons company is agent for various types of dynamos and motors, and, in fact, for all sorts of electrical goods.

Reduced rates to Hot Springs, Ark., are offered by the Wabash Line, which has on sale 90-day round-trip excursion tickets to the famous Hot Springs of Arkansas at very low rates; through sleeping cars to Hot Springs with but one change of cars—in St. Louis Union Station. Hot Springs is the only health resort endorsed and conducted by the United States government. The climate is like that of Italy. This is the season to go. Over 300 hotels, and boarding rates to suit all visitors. Illustrated pamphlets and

full information furnished by C. S. Crane, general passenger and ticket agent, St. Louis, or F. A. Palmer, assistant general passenger agent, Wabash ticket office, 97 Adams street, Chicago.

Builders of electrical power stations will be interested in the following statement relating to the desirability of galvanized corrugated iron for roofing, made by the Cincinnati Corrugating company of Piqua, O.: "Galvanized corrugated iron is to-day being sold at lower prices than painted iron sold for five or six years ago, which makes it a very popular roofing. Slate, being readily affected by heat and cold, cracks and falls off a roof. A fire close to a slate roof quickly cracks and breaks the slates, which then slide off the roof, and falling below, are liable to cause loss of life, while the roof framework is left exposed and readily catches fire. Our company is making a specialty of galvanized corrugated roofing, and will take pleasure in quoting prices, etc., upon application."

ILLUSTRATED ELECTRICAL PATENT RECORD.

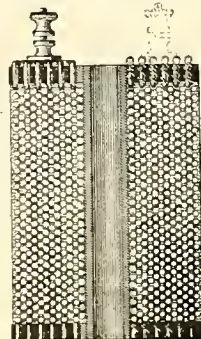
Issued January 17, 1899.

617,708. Conduit Electric Railway. Richard W. Barkley, New York, N. Y. Application filed June 13, 1892.

Claim is made for the method of preventing leakage in conveying an electric current from a conductor protected by air chambers from water, while the street or road is submerged, to a motor on a car, which consists in making contact between the trolley and conductor in the air chambers, and in causing the trolley to dive under the walls or partitions between the air chambers, losing and taking up contact with the conductor.

617,714. Electric Condenser. Charles S. Bradley, Avon, N. Y. Application filed December 16, 1897.

A condenser is composed of two conducting surfaces separated from one another by a spacer or thread of insulating material wound or peripherally arranged to leave spaces between the several turns of the thread.



NO. 617,714.

617,715. Enclosed Electric Switch. William M. Brown, Johnstown, Pa. Application filed September 11, 1897.

The closed insulating vessel and metal casing have tapered passages in the opposite walls of the vessel and casing, a post passing through the vessel and fitting in the bearings, and a switch member carried by the central portion of the post.

617,726. Counting Mechanism of Electric-supply Motor Meters. Sydney Evershed, London, England. Application filed June 7, 1898.

In a motor meter there is the combination with an armature axle of an electromagnet thereon, excited intermittently by a current derived from the armature, a balanced lever pivoted to lie in mid stroke at right angles to the axle, having a magnetic head surrounding the axle, adapted to reciprocate in the direction of the axis of rotation without retardation to the axle synchronously with the pulsations of the current, and means on the balanced rocking lever to actuate a counting train.

617,783. Electromagnetic Hone. Theodore R. Smith, Los Angeles, Cal. Application filed December 9, 1897.

The combination of a hone and an electromagnet is arranged with such relation to the hone that the lines of effective magnetic force through the hone are toward one pole of the magnet only.

617,793. Regulator for Constant-current Dynamos. James J. Wood, Fort Wayne, Ind. Application filed July 8, 1898.

Movable commutator brushes and a shifting mechanism are employed, together with a friction clutch, the driven member of which drives the shifting mechanism, means for rotating the driving members thereof continuously in opposite directions, an electromotive device controlling the clutch, and a casing enclosing the clutch formed with bearings for the working parts and excluding dust and moisture from the working surfaces.

617,866. Electric Igniter for Explosive Engines. Ferdinand E. Canda, New York, N. Y. Application filed August 25, 1897.

A speed-regulating mechanism for gas and oil engines is employed comprising a plurality of separate electrical igniting devices, adapted to ignite the charges at different periods in the stroke, and means for throwing the several igniting devices into and out of action at will.

617,837. Electric Railway System. Emil B. W. Reichel, Berlin, Germany. Application filed October 3, 1898.

Several motor cars are included in a single train with a motor controller upon each car, a graduated indicator is located near one motor controller to be within the presence of the motorman operating the latter controller, and graduated means for operating the graduated indicator, the means being governed by another of the motor controllers.

617,838. Electromagnet. Max Schiemann, Dresden, Germany. Application filed December 31, 1897.

A multipolar electromagnet comprising a conductive core, conductive spools carrying the wire coils, threaded on the core, the coils wound and interconnected to form a multipolar electromagnet with alternating positive and negative poles, the flanges of the spools constructed with a wide base at right angles to the longitudinal axis of the electromagnet.

617,839. Connection Counting Mechanism for Telephone Lines. Charles E. Scribner, Chicago, Ill. Application filed March 15, 1897.

The combination with a telephone line and a connection counter associated therewith, of a line jack and an answering jack connected with the line, a connecting plug for use with the spring jacks, and circuit connections of the connection counter with the answering jack only adapted to co-operate with circuits terminating in the plug to render the connection counter operative.

617,840. Lock-out Mechanism for Party Telephone Lines. Charles E. Scribner, Chicago, Ill. Application filed June 21, 1897.

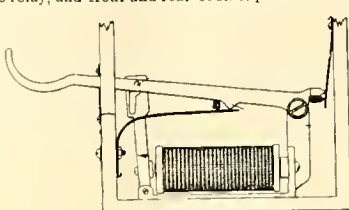
Means are provided for producing current in the line during the use of the line; there is a telephone switch at a sub-station, a magnet coil in the circuit of the telephone, and switch contacts of the telephone switch are adapted to complete the connection of the magnet with the line in the movement of the switch; mechanical means controlled by the switch are adapted to bring the armature of the magnet into contact with its poles when the switch is in its normal position.

617,842. Method of and Means for Deriving Poly-phase Currents. Herbert A. Wagner, St. Louis, Mo. Application filed November 13, 1896.

The method of obtaining difference in phase between two or more alternating-current branch circuits consists in connecting the branch circuits to different points in a single-phase supply circuit and to each other, and shifting the phase of one of the branch circuits, whereby a slight phase difference induced in the branch circuit will cause currents to flow through the other of the branch circuits differing in phase from one another and from the supply circuit.

617,853. Electric Signaling. John P. Coleman, Edgewood Park, Pa. Application filed December 2, 1897.

One claim is given: In a relay the combination of a magnet, an armature lever, a contact plate pivotally supported by the lever, means for preventing a movement of the plate independent of the lever during the normal operation of the relay, and front and rear contact points.



NO. 617,840.

617,854. Relay. John P. Coleman, Edgewood Park, Pa. Application filed January 20, 1898.

Pivotal supports for the armature are so arranged as to permit of movements of the armature in places at an angle to each other, and contact plates are pivotally mounted on the armature.

617,858. Magneto Circuit Closer. John E. Fuller, New York, N. Y. Application filed November 10, 1898.

The combination is claimed with the field magnet, the armature and its coil, of a switch having magnetic material that is acted upon by the change of magnetic strength and circuit-closing stops at opposite sides of the switch with which the switch is brought into contact in one direction by the action of a spring and in the other direction by the action of the magnetism.

617,886. Electrolytic Refining of Copper. Elias A. Smith, Anaconda, Mont. Application filed May 19, 1898.

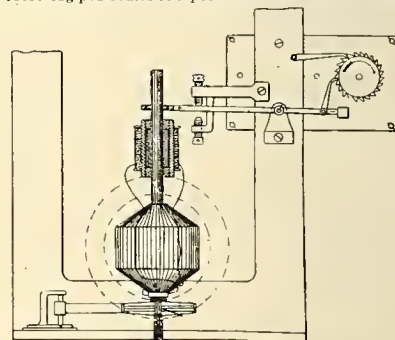
The electrolytic method of refining copper consists in depositing the copper from anodes thereof, immersed in an acid bath, concentrating the resultant impure electrolyte to recover, by crystallization the bulk of the copper salts (blue vitriol), further treating the "mother liquor" by progressive shallow evaporation at high temperature, under air exposure, to throw down the iron salts and to gradually concentrate the free acid, and upon subsequent cooling then adding suitable hypophosphite to remove the antimony and arsenic while retaining liberated sulphurous acid in solution, and thereupon diluting to complete the precipitation of antimony and arsenic prior to the return of the free acid to the refinery bath.

617,890. Telautograph. George S. Tiffany, Highland Park, Ill. Application filed May 29, 1896. Renewed February 11, 1898.

The method of transmitting telautographic messages consists in transmitting the movements of the transmitting pen into impulses of successively like polarity, transmitting these impulses by induction into pulsations of successively opposite polarity, and causing the receiving pen to move a step under the influence of each of the latter pulsations.

617,891. Telautograph. George S. Tiffany, Highland Park, Ill. Application filed February 8, 1897. Renewed July 29, 1898.

Claim is made for the combination of a receiving pen, an escapement for directly propelling the same, a magnet for controlling the escapement, a vibrating armature for the magnet provided with circuit makers and breakers, whereby the movement of the armature is continued automatically, and means connected with the receiving pen for opening the circuits of the escapement magnet when the receiving pen comes to a position of union.



NO. 617,842.

617,892. Telautograph. George S. Tiffany, Highland Park, Ill. Application filed August 21, 1897. Renewed July 29, 1898.

Provision is made for sending impulses of like polarity to line dependent to number upon the movement in extent of the transmitting pen, means for producing a series of induced pulsations of successively opposite polarity, and means for moving the receiving pen step-by-step operated by the to-and-fro induced pulsations.

617,908. Galvanic Battery. Charles T. Richmond, Cleveland, Ohio. Application filed July 18, 1898.

A carbon plate is adapted to serve as a cover for a counting jar and have two threaded bosses on its under side and a hole between the bosses, with two carbon porous cups which screw onto the bosses, the zinc element consisting of two curved plates which lie between the cups with their concave sides facing the cups, and a stem to which the plates are secured which passes out through the hole in the carbon plate and is insulated therefrom.

617,938. Electrical Alarm Mating. Arthur De Forest Risley, Richfield Springs, N. Y. Application filed January 27, 1898.

The elastic non-conductor is provided with orifices; the conducting strips are arranged respectively above and below the orifices, forming the insulated terminals of an electrical alarm circuit, and the loose conductor is caged within the orifices.

617,958. Electrical Apparatus for Freezing, Lighting or Extinguishing Gas Burners at a Distance. Paul L. Guycnot, Aix les Bains, France. Application filed July 30, 1898.

In an electrically operated apparatus for freezing, lighting and extinguishing gas burners by means of a ball valve, there is the combination of a ball valve having a plurality of valve seats, with an electromagnet adapted to operate the valve, a permanent magnet for determining which valve seat is to remain open and a reversing commutator.

618,042. Galvanic Battery. James D. Darling, Philadelphia, Pa. Application filed October 16, 1897.

An inclosing vessel contains an element in the form of a horizontal conducting plate having a surface of peroxide of lead applied thereto and an element of amalgamated zinc disposed in the form of a horizontal plate of comparatively small vertical height and fitting closely against the inner sides of the inclosing vessel, the elements being arranged with their proximate surfaces at a substantially uniform distance throughout.

618,043. Zinc Electrode. James D. Darling, Philadelphia, Pa. Application filed August 17, 1898.

Claim is made for the combination of a conducting rod, a zinc cup supported thereby and a mass of solid zinc amalgam contained within the cup.

Western Electrician

EVERY SATURDAY.

Vol. XXIV.

CHICAGO, FEBRUARY 4, 1899.

No. 5

New Plant for Heat, Light and Power in the Hotel Metropole.

Some remarkable economies have been achieved by remodeling and extending the power plant at the Hotel Metropole, so that one compact installation of modern machinery furnishes light, heat and power for all departments of the large hotel. The Hotel Metropole, owned by Mr. Francis J. Kennett and under the direction of Mr. William C. Bailey, is at Michigan avenue and Twenty-third street and is a quiet, family hotel of considerable size. For a number of years current for the electric lighting was taken from a central-station company, the cost of illumination averaging \$800 a month. At the same time the hotel people were operating a steam plant to heat the building and operate the elevators,

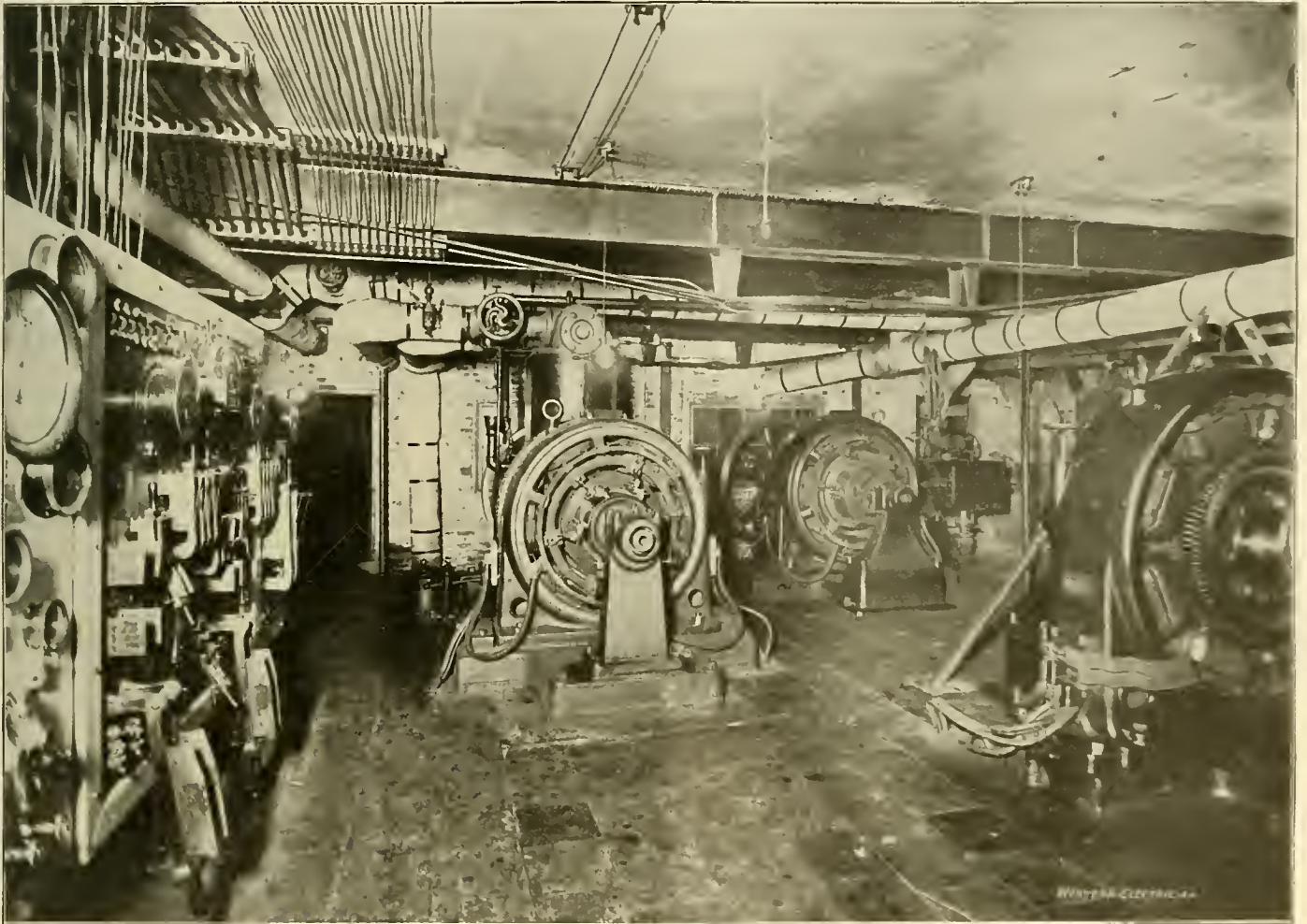
by the use of exhaust steam, the Paul vacuum system was installed, whereby a back pressure of less than one-half pound could be maintained at all times.

The method of operating the hydraulic passenger elevator was by the ordinary plan of duplex direct-acting pumps. To economize on the operation of this work, Gould triplex electric pumps were installed, operating by a motor connected by spur-gear rawhide pinions, which reduced the average consumption of power from 150 pounds of steam to 34 pounds of steam per horse power. As a further method of economy in connection with this pump, a Cutler-Hammer automatic starting-box was connected in such a manner that when a certain degree of compression in the compression tank was reached the motor would be stopped and entirely cease to consume power. When, by reason of the operation

etc., varying from two to 7½ horse power, the latter being used on an Andrew & Johnson fan to ventilate the hoods in the kitchen.

The question of the water supply was solved in a very satisfactory manner by drilling an artesian well, 280 feet deep. A Poble air lift was installed by the Sargent Rock Drill company, by means of which 50 gallons of water per minute are delivered into the house tank. This method of pumping artesian water has its advantages, both from an economical point of view and from the fact that the air passing through the artesian water almost entirely rids it of the sulphureted hydrogen gas entrained therein, making the water much more potable than where pumped by the ordinary process.

As a measure of further economy a contract was made with Westinghouse, Church, Kerr & Co. for



NEW PLANT FOR LIGHT, HEAT AND POWER IN THE HOTEL METROPOLE — ENGINE-DYNAMOS AND SWITCHBOARD.

spending, on an average, \$750 a month for coal. They also consumed ice costing, on an average, \$200 a month. The management decided to enlarge the building, and this was done by adding a wing, increasing the capacity of the hotel one-fourth and the electric-light consumption one-third by reason of the new banquet rooms in the annexed portion.

After a careful investigation it was decided that it would be more economical to install an electric-lighting plant, and as the former steam-heating plant had become very defective, partly from use and partly from the fact that it was one of the hurriedly installed World's Fair plants, to also rebuild, in a measure, the entire plant. The proprietor accordingly installed two generators of the Westinghouse type, direct-connected to two Fischer four-valve engines, one unit of 60 and one of 60 kilowatts capacity, and one Westinghouse compound engine direct-connected to a Westinghouse 75-kilowatt generator. The three engine-dynamos, with the switchboard at the left, are shown in Fig. 1. In order to reduce the back pressure which would be occasioned

of the elevator, the pressure fell slightly in the compression tank, the automatic starting-box would start the motor, again pumping it up to the desired pressure, thus cutting off the loss occasioned by condensation wherever slow-moving, direct-acting pumps are used. This electro-hydraulic pump outfit is shown in Fig. 2 (page 64). A smaller triplex pump of the same pattern to pump water for the house supply was also installed.

A third important improvement was the installation of two water-tube boilers of 225 horse power each. In order to get the head-room it was necessary to excavate to a point on a level with the base of foundations of the building, and set the boilers in a steel pan. Hawley down-draft furnaces were installed, and all pipes in the basement were covered with two thicknesses of magnesia pipe covering.

The laundry was operated by a slide-valve engine, consuming over 200 pounds of water per horse power. This engine was displaced by a 10 horse power motor. Several other motors were installed to operate ventilating fans, ice-chopping machinery,

the installment of a 15-ton ice machine, direct-connected and on the brine system. This machine furnishes the ice and refrigeration for the whole establishment.

Owing to the fact that the bell wiring of the institution had been put in in rather an unsatisfactory manner during the hurried construction of the building, great trouble had been experienced in keeping up the batteries and from the grounding of lines, short-circuiting, etc., necessitating daily attention in the way of repairs and renewals for the large number of batteries scattered throughout the building. A small motor-generator, supplied by the Crocker-Wheeler company, was installed and connected by means of main wires so as to displace all batteries, the result being that this generator is operating all the bells and call systems in the building continuously without trouble or inconvenience and so far without expense for repairs and without being stopped for more than two hours during the two years it has been in operation.

The benefits accruing to the owner by reason of the new equipment are noteworthy. For one thing,

the manager is able to operate every radiator in the building without the disagreeable hammering and pounding which is too often found in steam-heating installations, and without the disagreeable odor coming from the air valve and the annoyance of having the water running on the carpets, all of which are obviated by the use of the Paul vacuum system. As to the new electric plant, the management is to-day running three times the lights that it formerly did, has always a reserve unit as a provision against an emergency of any kind, has a pure and wholesome water supply, irrespective of the condition of the city water, and an abundant supply of ice. Its coal bills average \$550 a month through the year, or less than they were with the old steam plant alone by \$200 a month. This saving is partly due to the fact that the Hawley furnaces can be operated with nut coal at a less price than lump coal, partly to the economies obtained from the use of the Paul system, by utilizing the exhaust steam, and partly by the use of electric pumps and motors. The owner has no electric-light bills to pay, no ice bill and only a very small water bill (some city water being used in the boilers and for the purpose of washing the silverware).

The net economy is stated as follows: Saving on electric-light bill, \$800 per month; saving on ice, \$200 per month; saving on water, \$100 per month; saving on coal, \$200 per month; total saving per month, \$1,300; from which should be deducted the wages of one electrician at \$60 per month, which was the only additional help required, and cost of lamp renewals at \$50 per month, making a total

plants under his charge, showing the great flexibility of electrical apparatus. In two cases the power plant is reinforced by 600-volt, direct-current motors, driven by generators at other waterfalls, not far distant. In one case the distant wheel and generator is controlled from the principal station. A novel arrangement of secondaries was described, showing how a monocyclic generator may be used in emergency to supply three-phase circuits from the regular transformers.

The electrical engineering museum has recently been enriched by a number of pieces of station auxiliary apparatus secured from the Minneapolis General Electric company, showing various steps in the development of lightning arresters and switchboard apparatus.

A Heisler two-phase alternator, recently secured from the Mankato Electric Light and Gas company, is being modified for experimental use, a system of switches being arranged to permit the easy and rapid changing from 1,000 volts to 100 volts at will, also enabling the use of both pressures at the same time.

Curious Electrical Phenomenon.

In a letter to the New York *Tribune* Mr. Charles E. Phelps of New Brunswick, N. J., describes an interesting natural fire-ball display which he witnessed in his youth. His narrative is as follows:

"In the year 1834 I was living with my father in Oswego, N. Y., I being then 11 years of age. The time was the latter part of October or first of November—I cannot give the exact date. I was walk-

Blunard, in the port of Croisie, but must, it would seem, have been of electrical origin."

Success of the Electric System on the Alley "L."

From the annual report of President Carter of the South Side Elevated Railroad company of Chicago it is evident that the lately adopted electric system of car propulsion is very successful from the financial point of view. This is especially interesting, as the South Side road is the first in the country to use the Sprague multiple-unit system, by which each car is completely equipped with motors, controllers and contacts so connected and operated that they may be used as a distinct and independent car equipment or as part of the electrical propelling outfit of a whole train controlled by one man on any car in the train. It is also the first elevated railway having storage-battery station auxiliaries.

The net earnings of the company for 1898 amounted to \$295,944, as compared with \$121,943 in 11 months of 1897. After paying \$22,500 of bond interest there remained a surplus of \$273,444, equal to 2 3/5 per cent. on the capital stock. The full significance of the return is apparent, however, only when motive power is considered. The electrical equipment was in complete operation only for the last six months of the year, when net earnings were \$196,933. Deducting six months' bond interest there remains \$180,958, equal to dividends at the rate of 3 1/2 per cent. a year. While no dividends have been declared, earnings being expended largely in bettering the property, it is predicted that distributions may begin in April if conditions continue favorable, and that the stock may be put on a three per cent. basis.

In regard to a combination President Carter's report says: "The possibility of combination with another company has been under discussion from time to time since August, but thus far legal objections have prevented the formulation of any proposition for your property which your directors could recommend."

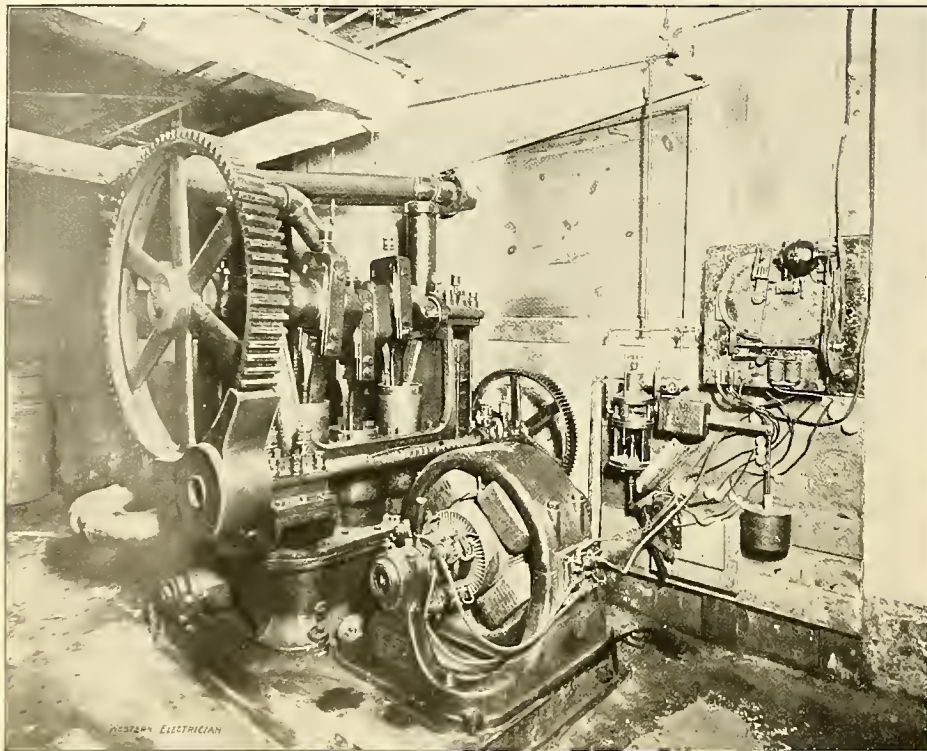
Of the electric system the president says: "We began using electric cars in April, had 67 in operation in May, and gradually increased the number until July, when they finally superseded the steam trains. We had minor difficulties to contend with, which were met and solved. None of them resulted in injury to any passenger, and none of them involving the control of the train, which has always been complete. We believe that the Sprague multiple-unit system has fulfilled expectations. A schedule speed of 15 miles per hour is easily maintained and time lost is easily made up. If needed in order to meet competition, your company has the ability to increase the speed to 20 miles an hour."

Mr. Carter's reference to the storage batteries is interesting: "While the amount of current used per car-mile is low, and has produced gratifying results in all tests and comparisons made, the fluctuations of power above the average requirements are large, and the sudden demands on the power house compelled us to prepare promptly for the heavier business of the winter, which, with increased number of cars in service, heat and light loads, would have been beyond the capacity of the power house. Additional engine capacity could not be obtained in the time at our disposal, would have cost more money, and have been expensive to operate. We accordingly installed two batteries of 750 kilowatts each, equidistant from the power house, at Twelfth and Sixty-first streets, respectively. These batteries have very greatly reduced the fluctuations and the maximum load at the power house. While the output at the power house is the same, the batteries charge at times of light traffic and discharge at times of heavy traffic, thus equalizing the work at the power house, and relieving the engines and generators. This is certainly an economy, and it is further claimed, with what correctness I am not yet convinced, that they cheapen the cost of production. But I do know that they keep up the voltage at the ends of the line, enable your road to operate more cars, furnish increased facilities to patrons, and prevent damage to power house machinery in case of sudden demand for increased power."

The great advantages of electrical operation are shown in striking manner by the table printed below, which shows that the percentage of expense to earnings fell from 84 per cent. in January to 55 per cent. in December. The average, inclusive of loop charges, was 60.8 per cent., and exclusive 60 per cent. Exclusive of loop charges in December the extremely low rate of 45 per cent. for operation was reached. This seems to be the best possible demonstration of the wisdom of the management in making the change in motive power. Following is the table, which includes other interesting statistics:

	Daily av. traffic.	Pct. inc. over 1897.	Earnings.	Expenses.	Pct. exp. to earnings.
January	52,117	47	\$ 82,927.22	\$70,242.55	84.7
February	52,691	47	76,119.32	63,597.85	83.6
March	54,828	54	87,631.33	71,101.20	81.1
April	54,149	56	84,391.38	68,170.47	80.8
May	49,459	51	79,925.78	59,101.25	70.2
June	45,477	53	70,633.88	53,442.91	75.7
July	44,118	64	70,662.98	49,762.77	70.4
August	41,770	54	67,733.75	43,175.99	63.7
September	46,576	55	72,336.36	45,681.43	63.2
October	58,198	48	92,618.58	52,602.76	56.8
November	59,257	*69	92,372.14	52,023.58	57.3
December	62,735	*10	100,938.78	55,583.40	55.0
Totals	51,777	42	\$978,291.50	\$682,385.56	69.8

*Loop in use in November and December, 1897.



NEW PLANT FOR LIGHT, HEAT AND POWER IN THE HOTEL METROPOLE.—AUTOMATIC MOTOR AND PUMP COMBINATION FOR ELEVATOR OPERATION.

saving of \$1,190 per month, or \$14,280 a year, making over 30 per cent. on the investment, notwithstanding the increased work for the plant by reason of the annex referred to.

This installation was designed and supervised throughout by Mr. Charles G. Armstrong, consulting engineer, Chicago.

University of Minnesota.

Among the recent non-resident lecturers before the College of Engineering of the University of Minnesota were two well-known electrical engineers.

On January 24th Mr. J. J. Carty, chief engineer of the New York Telephone company, gave a lecture on "Telephone Disturbances." The sources of the disturbance upon telephone lines were discussed in an able and interesting manner and were illustrated by numerous diagrams. Special attention was given to the problems presented by the increasing use of high-tension alternating currents for power transmission and their effects upon telephone circuits. Experiences of the telephone lines at Minneapolis and St. Paul with the 3,750-volt and the 12,000-volt, three-phase circuits of the Twin City Rapid Transit company and those of the Minneapolis General Electric company were related and explained.

On January 26th Mr. Truman Hibbard, general manager of the Willow River Electric Light and Power company of Hudson, Wis., lectured upon "Hydroelectric Power Plants," discussing certain features of three phase and monocyclic systems for transmission and distribution purposes. Mr. Hibbard gave an interesting account of the power

ing up from my father's store, in First street, with our hired boy. It was about eight o'clock in the evening. The night was quite dark. We saw as we walked the street what we supposed to be a man with a lantern about half a block before us, going in the same direction, but gradually increasing the distance between us, until by the time we had arrived at our corner he was apparently a whole block ahead, at our upper corner. We turned to enter our gate, in Fifth street, which was but a short distance away, but before we got to it the man (as we supposed it to be) had rushed back the whole distance of 230 feet or thereabouts, the light appearing at the corner we had just left.

"I thought it was very strange, and, considering the matter, I turned back after entering the house for a moment to examine matters. It was clearly impossible for a man at his utmost speed to have run 230 feet while we were walking 20 or 25. I saw no more just then of the light in the street, but in a moment or two a brilliant flash flew from the corner of the house opposite ours. The house was just then vacant. After a minute or two there was another flash, succeeded by others.

"The lights were not very brilliant—not enough so nor frequent enough to arouse the neighborhood. Sometimes the lights seemed to come out of the chimney of the house, sometimes they descended to the ground and rolled slowly along, as we had seen them at first, going southward occasionally a quarter of a mile or so, and then returning or disappearing, as the case might be. After a couple of hours or so the lights became less frequent and finally disappeared.

"This phenomenon clearly could not have been of a vaporous origin, like those described by Dr.

A condensed statement of earnings and expenses, with the balance sheet, is as follows:

EARNINGS.	
Passenger.....	\$914,926.50
Other earnings.....	29,695.79
Miscellaneous receipts.....	4,297.73
Total.....	\$948,919.02
EXPENSES.	
Maintenance of way and structure.....	8,315.77
Maintenance of equipment.....	51,153.62
Conducting transportation.....	373,850.87
General expense.....	63,311.68
Loop rental and expenses.....	133,319.29
Taxes.....	26,108.33
Total.....	\$662,385.56
Total operating earnings and receipts.....	976,533.02
Less operating expenses.....	682,385.56
Net earnings.....	\$295,047.46
Deduct interest on bonds (May 1 to Dec. 31, 1898).....	22,500.00
Surplus for year 1898.....	\$272,547.46
ASSETS.	
Cost of property.....	\$11,243,886.42
Capital stock in treasury.....	69,255.00
Materials and supplies on hand.....	17,407.25
Due from companies and individuals.....	4,896.29
Due from agents.....	3,412.50
Current assets.....	6,350.50
Cash on hand.....	202,355.78
Total.....	\$11,547,563.74
LIABILITIES.	
Capital stock.....	\$10,323,800.00
Funded debt.....	750,000.00
Reserve for 1898 taxes.....	75,238.78
Depreciation.....	39,538.76
Current liabilities.....	53,087.31
Reserve.....	355,848.89
Total.....	\$11,547,563.74

Poor Electrical Construction.

The quarterly report issued by the Electrical Bureau of the National Board of Fire Underwriters contains interesting data upon the damages caused by poor electrical construction. The holiday season, which was included in the period covered by the report, was prolific of fires due to defective wiring of a temporary character, principally in show windows, where, on account of the material used for decorations, great care should have been exercised. Details of a few of the cases reported are herewith presented:

An open cutout was placed in a show window, and when a fuse was blown the molten metal was scattered over the decorations, which became ignited, completely burning out the show window and entailing a loss of \$200.

Fire started in a show window decorated for the holidays with cotton batting. The wiring was of a temporary nature and fuse blocks for the window circuit were located inside the window. It is impossible to state the exact nature of the trouble which caused the fire. While engaged in decorating the window the trimmer heard behind him a report like the blowing of a fuse or the breaking of a lamp. The cotton batting ignited instantly and the window trimmer was seriously burned before he could get out of the window. The fire spread with great rapidity, igniting the inflammable material in the store, in which handkerchiefs and other light fabrics were festooned from one end to the other. Heroic efforts were made by the firemen to confine the fire on the premises, but without avail. Several business blocks were destroyed. Two persons were lost in the fire and fourteen injured. The loss on buildings and contents was \$600,000.

Short-circuit of electric wires in a show window filled with inflammable material resulted in a fire which lasted for a period not exceeding twenty minutes, but burned fiercely for that time, filling the large store with smoke and breaking large plate-glass

tion is presented in Fig. 3, which shows the action of a ground of series arc wire on the limb of a tree, which burned through five inches of the limb and let it fall in the street. The case was reported by W. T. Benallack, electrical inspector, Michigan Inspection Bureau.

Practical Application of the Electric Motor to Printing-press Machinery.

By W. H. TAPLEY.

During the last five years the electric transmission of power has made most rapid strides. Aside from long-distance transmission and railroad work, we can safely say that the individual motor application to machinery stands in the first ranks.

There are no statistics giving the aggregate horse

a dangerous rival of direct motors. All individual motors should be so attached to frame of press as to be practically part of it; separate motor foundations are a failure. Geared motors should be supplied with rawhide pinion having brass bevel and sides, always using angle reduction. Ratios of 10 to 1 are permissible where press speed is not over 120 revolutions per minute; 5 to 1 and 3 to 1 where the speed is 175 revolutions per minute and upward. Direct motor should be used where none is an objection, as well as on all large presses, especially for newspaper work.

Each equipment should be provided with an automatic circuit-breaker, one that will protect press while looking after the motor. This is an absolute necessity, if we would obtain all the advantages of the individual drive.



FIG. 1. POOR ELECTRICAL CONSTRUCTION.

power now used for this purpose, yet it is safe to assert that no one branch of machinery can show the results in power saved, improved product and increased output from the application of the electric motor that printing machinery can show.

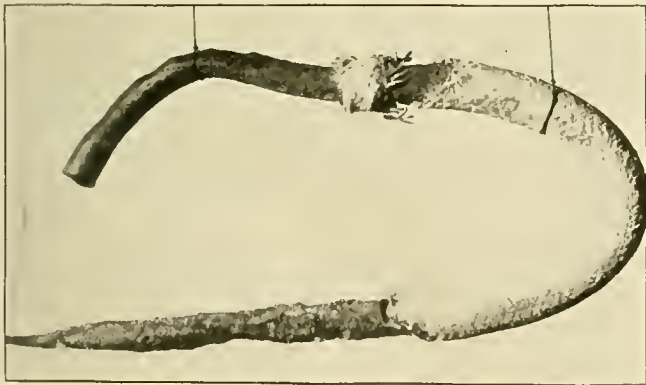
The printer demands that all the good features of the belt drive as to power and convenience of handling be retained when the individual electric motor is substituted for belt power.

That nothing be sacrificed in economy of operation and completeness of outfit it is necessary that care be exercised in the selection of the type of motor, method of control and attachment.

If this is to be done, the first step consists in becoming familiar with printing-press work, studying

The cost of direct versus geared press equipment for new presses is 25 to 33 1/3 per cent. more for the former. Where old belted presses are to be changed, with conditions equal, the cost is about the same, the gearing with fixtures amounting to the difference in cost between motors. This applies to five horse power motors and larger; smaller sizes may cost very much more, sometimes double.

General advantages secured by substituting individual-electric drive for belting are economy of power, positive speed applied direct to main driving shaft of press, ability to locate press without reference to main line of shafting, freedom from dust and dirt, a higher grade of work and increased output, which should amount to 15 per cent., without



FIGS. 2 AND 3. POOR ELECTRICAL CONSTRUCTION.

windows. The amount of insurance involved was \$320,000 on stock and \$15,000 on furniture and fixtures, and the amount of loss adjusted and paid on stock was \$13,525.33, on fixtures \$752, and on building \$1,516.

Flexible cord, used in show windows in violation of rules, short-circuited. The fuse block was outside of the window and fused at 2 amperes. (Rule 21, d. National Electrical Code, requires 6 amperes protection.) When short-circuit occurred fuse did not operate until cord had become heated, igniting inflammable material in the window. Loss, \$3,500.

Christmas decorations were installed on the ceiling of a store and attached to the circuit at fixture outlet. Wires, which were covered with evergreen, were short-circuited, and the arc set fire to decorations.

Fire in a show window caused by holiday wiring with unpaired, undersized connection. A loose joint started a fire which ignited inflammable material.

These are not the only incidents related, however. The accompanying cuts show other defects. Fig. 1 shows temporary border lights for a mimic theater at Boston, where poor contact ignited the insulation of the wire. Fig. 2 is an example of the effect of electrolysis on underwriters' wire installed in violation of rules in molding exposed to moisture. The specimen is furnished by F. D. Varnum, electrical inspector at St. Paul. Another interesting illustra-

tion of the mechanical features of the press to be equipped. Then, and not until then, are we ready to take up the electrical end.

Of the series, shunt and compound motors, the latter gives the most satisfactory results.

Belted, geared and direct-connected motors can be used, although only geared and direct are distinctly advantageous over belting from main-line shafting. The selection as to which is better must be decided in each individual case. Control of press must be positive as to handling, under all conditions, and providing a suitable range of speed. Where possible, arrange presses to operate at a uniform rate of speed, doing away with the demand for wide extremes, which are rarely used.

Of the various methods of control for direct motors, a combination of armature and field control is best. Armature control, with carefully proportioned gearing, in sizes up to five horse power, is

extra wear on machinery. This will easily pay for the electric equipment within three to five years.

As a reliable method of power application, the electric motor is without an equal, for, when properly designed for its work, supplemented with substantial attachment, the repairs are practically nil.

With flat-bed presses, printing 32 pages, 16mo., per impression, an average product can be secured, including all allowances for "making ready" and handling paper, of 21,000 pages per kilowatt-hour. With a price of five cents per kilowatt-hour, 4,200 pages can be printed for one cent.

Web presses, doing the same class, size and grade of book work, will print, cut and fold 91,000 pages per kilowatt-hour. Taking the same price, 18,000 pages are printed for one cent. A comparison shows a balance of 4 1/2 times in favor of the web presses.

When a large number of presses is in use, a safe ratio of 5 1/2 to 1 can be taken as the horse power in motors to the horse power in generators installed.

1. Abstract of paper read before the electrical section of the Franklin Institute, Philadelphia, January 21, 1899. Mr. Tapley is connected with the Government Printing Office at Washington.

Steel Arch Bridge at Niagara Threatened by Ice Bridge.

By ORRIN E. DUNLAP.

The Niagara ice bridge of 1899 will long be remembered as being one of the greatest formations of the kind ever seen in the gorge below the falls. Niagara has always been noted for its wonderful ice scenery and ice bridges, but the conditions of this year have been ideal for bridge making. The first ice bridge of the season formed early in January, a few days before the expected period, but it soon gave way to a stronger and a better bridge, which stood fast in the gorge until Sunday, January 22d, when a heavy wind blowing across Lake Erie drove the water and ice into the entrance to the Niagara River at Buffalo in such quantities that the water in the gorge increased in height 30 feet above the normal mark. This had the effect of loosening the ice bridge, and on that afternoon, when people were crossing it, it broke loose and started down stream. On the banks were thousands of Sunday visitors who had come to the falls to see the sights, but such an occurrence was unhopd for and unexpected. It looked very much as though a terrible catastrophe was about to take place. People who were on the bridge when it first started to tremble and move hurried toward shore. All but three persons succeeded in getting to shore quite readily. The trio left on the moving mass of ice was a young man near the New York shore and a lady and gentleman a little farther out toward the center. The young man first referred to displayed considerable coolness. Looking down-

ice had become stationary, it was recognized that such an ice jam was an element of great danger to the bridge, and men were set to work blasting the ice from about the abutments, over which it had piled fully 50 feet deep. They worked night and day, and managed to break quite an opening in the mass in front of the abutments and the tunnel portal, as shown in Fig 1.

On Thursday, January 26th, there was another period of high water and the ice again crowded about the abutments, and again men were set to work blasting it away. Between the bridge abutments and the falls there is an immense quantity of ice which high water may carry down on the bridge. By the first crush of ice some of the lower girders of the arch were bent slightly. The abutments of the steel arch are located very close, dangerously so, to the water's edge, but they were thought to be high enough and out of reach of the ice until this year's jam proved that an ice bridge will always have danger in it for the arch, the greatest in the world. To get a full conception of the danger an ice bridge has for the steel structure one has only to reflect upon the immense quantity of ice in one of these jams, and then to realize that it is pushed onward by the full force of the 15,000,000 cubic feet of water that comes over the Falls of Niagara every minute. With its force pent up for a few minutes, nothing that man could construct could withstand such a mighty force as that of the falls. The steamer docks on both sides of the river were torn away by the action of the ice, and both incline railways were in considerable danger.

In addition to the ice bridge, Niagara this year

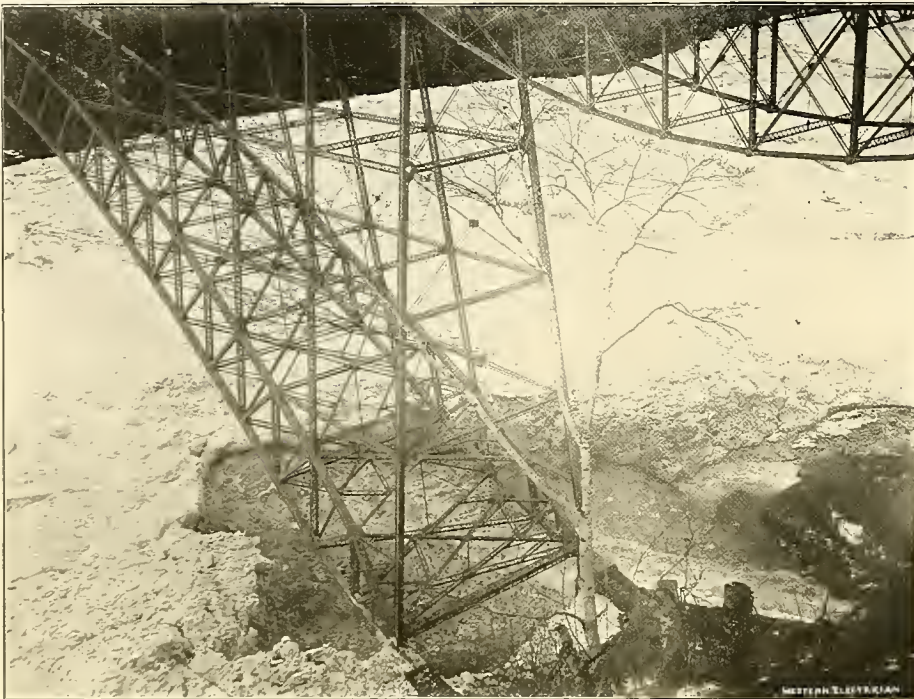


FIG. 1. STEEL ARCH BRIDGE AT NIAGARA THREATENED BY ICE BRIDGE.

stream, he observed that the ice was piling up very high about the abutments of the new steel arch bridge. So high did this mountain about the abutments become that the icy mass rested far out on the main span of the arch. Standing quite still, the young man fixed his eyes on the mountain of ice about the bridge. The people on shore quickly saw what he was about to do. It was evident that he intended to leap from the ice to the arch as he was swept up to it. Closer and closer the jam moved to the bridge and higher and higher the ice piled out on the main span. He was fairly lifted from the ice bridge to the arch by the crowding of the cakes, and then he was safe. Just beyond the arch the stream of water from the portal of the Niagara Falls Power company's tunnel strikes the river, and had he been carried to that point he might have been lost. The lady and gentleman had turned their faces toward Canada and were fairly flying across the runaway bridge. Time and again the woman fell, but each time she was encouraged on by her companion. Finally they reached shore. The woman was Miss Besie Hall of Johnsonburg, Pa., and the man Mr. C. Misner of Buffalo.

These are the incidents that led up to the formation of the greatest ice bridge Niagara has ever known. The mass of ice that came down over the falls that Sunday afternoon became jammed in the gorge back of the old ice bridge, which did not go out, but being fast and piled up to an unusual thickness. From the Horseshoe Fall down the gorge for a mile the bridge stretched, the ice being from 20 to 50 feet thick. At one point it is piled up in a mountain like, while in other places there are deep crevasses which clearly indicate the depth of the mass.

It is over the steel arch thus threatened by the ice jam that the Niagara Falls Park and River Railway company operates its trolley line. After the

has an ice palace to interest visitors, and all this has served to keep the electric roads very busy. The ice palace is located opposite Prospect Park on the riverway, near the end of the upper steel arch bridge, across which the electric cars are operated. A view of the river, filled with ice at this point, is presented in Fig. 2. On the Canadian side a toboggan slide has been built, and the sport has been of an international character. From the steel arch a powerful searchlight has been operated, and its beams on the ice in the gorge below revealed a weird and attractive scene.

Early Electric Lighting in Chicago.

In relation to the connection of the late Milan C. Bullock with pioneer electric-light installations in Chicago, the M. C. Bullock Manufacturing company writes as follows: "In 1880 Mr. Bullock installed a Brush dynamo with storage battery and Swan lamps at 86 Market street, and in the late summer or fall of that year a light was swung from that building out over a platform on Market street for the purpose of furnishing light to a political gathering. Mr. Bullock at that time was the northwestern general agent for the Brush Electric company, and from 1880 till 1884 (when Mr. Alexander Kempt was appointed agent) Mr. Bullock installed a great many plants in Chicago and in different parts of the Northwest district. The fact that no record of the installations made prior to 1884 appears in the city electrician's office is probably explainable by the circumstance that our 'city fathers' did not sufficiently realize the importance of the electric-light industry and the figure it was to cut until 1884, when a system of inspection was adopted."

The Southern Iowa Electrical company is an applicant for a franchise at Moulton, Ia.

Latest Progress in the Application of Storage Batteries.¹

By JOSEPH APPLETON.

PART I.

The history of the storage battery in this country is curious, and probably comprises more troubles and trials than any other branch of the electrical industry.

Until 1894 the use of storage batteries in this country proved most disastrous to all concerned. The reasons were many, but may be summed up briefly as follows:

1. The batteries were poorly designed.
2. No attention was paid to the mechanical features, the chief idea being to get the greatest capacity for the lightest weight.
3. The batteries were much overrated, their full capacity being given as their normal working capacity.

In addition to this, the storage-battery business, generally, was in an unsatisfactory and weakly condition. Litigation was the principal cause. The fear of protracted and costly law-suits prevented capital being invested in the business and frightened prospective users from purchasing storage batteries.

Now the conditions are very different. You are all familiar with the changes which have been made during the last five years in the commercial end of the business. All the disturbing elements have been removed, and the business has been put on a proper and substantial basis. The figures for 1898 have not been tabulated, but they will show that the use of storage batteries is progressing more rapidly than ever:

	Weight of plates alone.
1894	349,000 pounds
1895	1,112,800 pounds
1896	2,315,300 pounds
1897	3,607,300 pounds

(or 10 times the business of 1894).

The storage battery is entirely different from any other piece of apparatus which is used for supplying electrical energy, being constructed and operated on the principle of chemical action instead of mechanical motion. There must naturally be a vast difference between these two principles.

In the mechanically operated apparatus, or generator, the output of electrical energy is the result of the conversion of the mechanical energy applied to it while in action, and the regularity of the output is dependent on the steadiness of the mechanical energy applied and the satisfactory running of the generator and motive power. The operation is purely mechanical, and is subject to the interruptions to which all moving machinery is liable. Again, such apparatus, if overloaded to an excessive degree, will give visible signs of distress, and if the overloading is very great, or is continued, will probably give way in some mechanical feature.

In a storage battery hundreds of horse power can be silently stored, and thousands of horse power delivered for a short period, with no apparent action or change in the battery. The action is purely chemical, and as long as the respective elements are there to be acted upon it will surely continue.

It is this fact which makes the storage battery so reliable. Such a thing as instantaneous failure or interruption of the delivery of energy is impossible, except, of course, in the case of mechanical injury to the battery from an external cause.

Any mechanically operated apparatus is liable to interruption through breakage or injury to one of its parts, but in a storage battery the chemical action will continue, and consequently the output of energy, until all the material on the plates has been converted.

An overload has not the same effect on a storage battery as on a mechanically operated generator. For a short period an overload, even of great extent, does not injure a storage battery. It causes the chemical action to take place more rapidly, or, to be more exact, causes more material to be subjected to the chemical action, and this, if not continued too long, or repeated too often, does not affect a good storage battery. Moreover, if the overload is continued too long, it does not mean the sudden failure and collapse of the battery and complete interruption of the output, but is shown by the premature depreciation of the plates in the battery. It may not be noticed for months or even years. One of the most valuable features of a storage battery is that it will safely take care of any sudden and momentary overload in the system, such as grounds or short-circuits, and if operating in parallel with generators or rotary converters, will relieve them of such overloads and consequent strain. I have frequently seen batteries burn out grounds on an underground system, discharging for a short time at an enormous rate. And in the case of batteries operating on railway loads, it is a common thing to see an occasional momentary discharge at a rate equal to twice the hour-rate of the battery. The modern storage battery is designed to stand such occasional extreme discharges, and do so without injury.

It may be well to consider before going further into our subject the question of the rates of charge and discharge of storage batteries, and their capacity at different rates. Of course, this will vary some-

1. Abstract of paper read before the New York Electrical society, January 12, 1899.

what with different types of battery, but not to a great extent. The more rapidly you discharge a battery the smaller is its available capacity. For example, the following curve illustrates the available capacity of a storage battery when discharging at any rate between the 10-hour and one-hour rate. That is to say, when the battery is completely discharged in 10 hours and in one hour. It is only within the last few years that a one-hour discharge rate has been possible with a storage battery, and it is very largely due to the fact that storage batteries can be discharged at such rapid rates that their use has been growing so rapidly.

In large engineering problems the storage battery is used chiefly to supply large amounts of electrical energy for short periods, and by increasing the allowable rate of discharge the size of the battery required is consequently reduced. In connection with this question of the reduced capacity of storage batteries at rapid rates of discharge, there is frequently a mistaken idea that if the capacity of a battery is thus reduced, the efficiency is correspondingly impaired. This is not so at all. It is only the available capacity of the battery which is reduced by polarization, or, in other words, the chemical action when taking place at such rapid rates can only reach the active material, which is

the highest possible economy in operation, and the utilization of motive power and generating machinery to the fullest extent, so that the investment may produce the greatest return. These conditions make the storage battery indispensable, for without its aid it is impossible to maintain a constant load on the power house.

Every application of electricity has its time of maximum output or "peak," and no matter how many different applications are supplied from the same system their peaks will not fit in so as to even matters up, but, on the contrary, it is found that in many cases the peaks occur at about the same time. This is particularly noticeable with a railroad and lighting load. Again, concentration of generating machinery means a larger area for distribution and the necessity of sub-stations in order to keep down the investment in conductors, and experience shows that in the majority of cases storage batteries are cheaper than the copper alone, which would otherwise be necessary, leaving out the advantages at the power house. This means that the storage battery will now play a most important part in all electrical problems, and be of sufficient importance and value to warrant the conditions being made suitable for its use, instead of, as in early days, being dumped in at any time to

are 50,000 square feet of floor space available and that 90 per cent. is unobstructed by posts or partitions. Permanent office and committee rooms for such necessary facilities for headquarters, and at slight expense a meeting room can be partitioned off at one end of the hall and arranged for the session of the convention. The building is well adapted for exhibitions of machinery, and admits of a blouse and a half from railway tracks, excellent sleeping facilities are assured. The means for reaching the city are exceptionally good, and power is available for the operation of apparatus on exhibition. The members of the committee will visit the building on Monday and decide upon the question of holding the meetings there. In the event of favorable action the local street-railway men will immediately organize local committees, and the actual work of preparation will begin.

The subjects to be discussed at the fall meeting will be selected at the meeting of the executive committee on Monday, and assignments will be made at the same time, but the names of the gentlemen preparing the papers will not be published until their acceptances are received by the secretary.

Experiments with Liquid Hydrogen.

[London Correspondence of the New York Sun.]

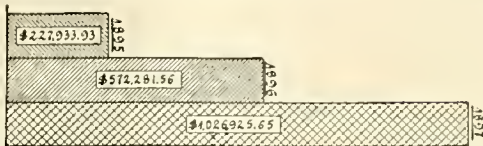
It is now eight months since that final triumph of the laboratory, the liquefying of hydrogen, was accomplished, and Professor Dewar at the Royal Institution on January 20th described that most volatile of gases when reduced to the coldest substance ever known.

When pure it is a colorless, transparent liquid, with considerable refractive power. It had a well-defined meniscus, but no appearance of being a metal, as Faraday thought it might prove to be. It is not a conductor of electricity. Its density is very deceptive. At first he thought it might be about half that of water, but by measuring a given volume and ascertaining how much gas it produced, he found its density to be only one-fourteenth of that of water, or six times less than that of the lightest liquid hitherto known. One liter weighed only 70 grammes. It instantly froze and solidified air and oxygen, and hence enabled the density of those two solids to be ascertained.

A little ball cooled in it and exposed to the air was first covered with a coating of solid air and then be-



Weight of Plates for 1895-6 and -7.



Money Paid for Plates in 1895-6 and -7.

LATEST PROGRESS IN THE APPLICATION OF THE STORAGE BATTERY.

on the surface of the plates and immediately exposed to the electrolyte. Hence, in reality, the actual capacity of the battery is not reduced, only the available capacity, and when the battery is recharged, only the active material that is acted upon has to be converted and not the entire amount of active material. There is a slightly greater loss in efficiency when discharging at a rapid rate due to the internal resistance of the battery, this being the C.R. loss.

Storage batteries are not free from trouble, any more than other apparatus, but, under favorable conditions, the comparison is much in favor of the storage battery. No piece of apparatus yet made is perfect, and its usefulness and consequent general adoption may be said to be proportional to the predominance of its useful features over its weaknesses or troubles. The rapid growth in the use of the storage battery during the last few years is the best proof possible that its troubles are very small, compared to its advantages.

As is the case with all machinery and apparatus which have to be operated continually for any length of time, the results obtained depend not entirely on the design and construction, but on the care and judgment with which it is operated. This fact is particularly noticeable to anyone who is constantly brought into contact with different plants and installations, as I am, and under different management, or sometimes mismanagement, in all parts of the country, and this subject alone would afford a very interesting and profitable topic for discussion and consideration.

In the early days the storage-battery manufacturers, in order to maintain a bare existence, had to jump at every opening for the use of a storage battery, whether the conditions warranted it or not, and in order to do business accepted contracts drawn entirely from the purchaser's point of view, without regard to the capabilities of the storage battery, and guaranteed results which, to say the very least, were extremely difficult to realize. What the results of all this were you know very well.

Now things are entirely different. The business is on a commercial basis, and it is not a question of getting an order at any price, but securing business which will prove satisfactory and permanent. Now storage-battery manufacturers will insist on proper conditions for the operation of their batteries, or refuse to put them in. This is as it should be, and I think I am perfectly safe in saying that during the last four or five years there has not been a storage battery installed in this country except under conditions which justified its use. Of course, some experimental applications have been made, which may or may not prove satisfactory, but this does not come under the head of the general application of the storage battery.

It should be distinctly understood that all conditions of electrical distribution are not suitable for the use of storage batteries, and that it is more to the interest of the manufacturer than the purchaser to confine himself only to those situations which are suitable, for every failure which is recorded is heard of one hundred times to every success.

Now that, by this method of doing business, confidence in storage batteries is being regained, and proper relations have been established between manufacturers and users, the growth of the use of storage batteries will be still more rapid, for it is now realized that when storage batteries are installed and operated under proper conditions that the result will invariably be satisfactory.

The trend of electrical engineering is to-day toward the concentration of generating machinery,

fill up a gap and smooth over any difficulties which cropped up.

American Street Railway Association.

By direction of the president, a meeting of the executive committee of the American Street Railway association will be held at the Auditorium Annex, Chicago, on Monday, February 6th, at 10 a. m. The members of the executive committee include Charles S. Sergeant of Boston, Henry C. Moore of Trenton, Ernest Woodruff of Atlanta, Walton H. Holmes of Kansas City, Albion E. Lang of Toledo, George A. Yuille of Chicago, Frank G.



FIG. 2. STEEL ARCH BRIDGE AT NIAGARA THREATENED BY ICE BRIDGE.

Jones of Memphis, John I. Beggs of Milwaukee and Ira A. McCormack of New York.

As the object of the meeting is to consider the arrangements for the next annual meeting of the association, representatives of the Chicago surface roads will be present. Secretary Penington, who made the arrangements for the meeting of the executive committee on his return from Boston after an interview with President Sergeant, expressed the opinion that the organization would follow the programme adopted at Boston and hold the meeting this fall in this city.

The only serious drawback to this arrangement has been the lack of satisfactory quarters for holding the meeting and the exhibition, and it is now believed that this objection has been met by securing Tattersall's building. Mr. Yuille, who was appointed a special committee by the local street-railway men to investigate this matter, has reported favorably upon this location. He says that there

can to drip liquid air. A piece of cotton wool stuck in it appeared to be magnetic, but the liquid itself, Professor Dewar is satisfied, is not magnetic. This phenomenon must therefore be due to the cotton wool being immediately filled with solid oxygen, which is highly magnetic.

Professor Dewar explained how vacuums of high tenacity were easily obtained by immersing a closed tube in liquid hydrogen. The air in the tube was immediately solidified, and if the tube was so arranged that the portion containing the accumulation of solid air could be sealed up, the other part had, according to Sir William Crookes' calculation, a pressure amounting to only one ten-millionth of atmosphere. With vacuum vessels for use with hydrogen, it was therefore not necessary to pump out air; it was only needful to put liquid hydrogen in a double-walled vessel and it made its own vacuum by solidifying the air between the two walls.



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DEPARTMENTS.

Table listing departments with page numbers, including 'Correspondence', 'Electric Lighting', 'Electric Railways', etc.

Well-informed public men in Washington entertain the belief that the project for building a government cable from San Francisco to Manila is assured of adoption by Congress and approval by the president.

She will take deep-sea soundings from Hawaii to Guam, and from Guam to Manila. The cable route from San Francisco to Honolulu has already been surveyed by the Albatross and Thetis, and carefully prepared reports of the soundings and maps of the ocean bed are in possession of the government at Washington.

Among the measures now demanding attention at the hands of the Chicago City Council is an ordinance requiring elevated-railway companies to equip their systems with automatic block signals, so as to prevent more than one elevated train in a block at a time.

A proposition to introduce mechanically propelled buses in Chicago calls attention to the condition of the city's pavements, which has heretofore prohibited the general use of electric vehicles in this city.

It is practically settled that the next meeting of the American Street Railway association will be held at Tattersall's building in Chicago, although the approval of the executive committee of the organization, which will meet in Chicago on Monday, will be necessary before the question is finally determined.

In the discussion of the proposed franchise of the Illinois Telegraph and Telephone company granted by the Chicago City Council on January 23d and vetoed by Mayor Harrison on January 30th, the question of the prevailing rentals for the service of the Chicago Telephone company has been brought prominently forward.

The grounded trolley wires and the introduction of high-voltage alternating currents render grounded telephone lines almost inoperative, and this ordinance, if drawn for the purpose of securing for telephone patrons a satisfactory service, should require all lines to be complete metallic circuits, and a further provision that no additional charge shall be made for any improvement or device for the benefit of the service.

It would appear from this that Mayor Harrison was under the delusion that there was some justification for the added charge of \$50 for metallic circuits. If such is the case he should consult the

ordinance granting the franchise. There is no mention of grounded circuits as the basis of the rates established at that time, but there is an explicit statement that the Chicago Telephone company, "during the term for which this ordinance is granted, shall not increase to its present or future subscribers the rates for telephone service now established."

An urgent appeal has been made to the Navy Department to secure favorable consideration of a proposition to extend the use of electricity upon the three new battleships, Alabama, Wisconsin and Illinois, to the same degree that it is employed in the Kearsarge and Kentucky. The main difference in the present plans in the omission of electric power for the boat hoists and the big winches.

An attack will be made upon the electrical corporations of Illinois, with special reference to the electric-lighting industry of Chicago, by the Legislature now in session, according to present indications. A bill for this purpose has been introduced in the lower house, the object, as stated, being to enable "cities to construct, maintain and operate all public utilities."

It is proposed by the instigator of the movement to keep the subject prominently before the Legislature until some action is taken. He explains that "this legislation has been proposed not only to meet the demand of public opinion with regard to municipal ownership, but for the purpose of enabling the city of Chicago to sell electric light."

The measure contains the referendum clause providing that "the people of the city may have an opportunity to vote on the proposition before it carries."

It is objected that the measure is too radical to command general support. It has been pointed out that the bill contained so much that it would not meet with success in the Legislature, and that if the author had confined the subject matter to the question of selling electric light it would have stood a better chance.

DEVELOPMENT OF THE TELEPHONE FIELD.

Recent Progress in Exchange Working.¹

By HERBERT LAWS WEBB.

The obvious direction for improvement in telephone operating to take is that of automatic working. Absolutely automatic working in large systems is practically unattainable, for no machine could possibly be made that would have selective powers sufficient to deal, in any ordinary period of time, with the multitude of different numbers and points among which selections have to be made by the operator in a large telephone system. There are several automatic telephone-exchange instruments that are marvels of mechanical ingenuity and skill, rivaling in delicacy and complication many of the wonderful machines used in manufacturing small articles and in such work as typesetting. These instruments have been brought to such a point that they are capable of dealing with the work of a small self-contained exchange. Much beyond that they will never go, for reasons that will be obvious to anyone who has ever looked into the working of a large telephone system. Briefly, it may be said that the selective powers of any machine that can be made commercially operative soon reach a limit, while the selections to be made in a large telephone system are practically unlimited, and the patience of the average telephone user is very limited indeed.

While we can never hope to eliminate human labor entirely from telephone operating, there is ample opportunity to reduce the amount of human labor required to handle each connection, and so render the operation more automatic, and consequently quicker. In every telephone connection the necessary operations for its making and unmaking have to be performed partly by the users of the service and partly by the trained operators at the exchange. Tracing the steps of an ordinary connection on the magneto system, we find them to be as follows:

1. The calling subscriber rings his bell, or more accurately, turns his magneto generator, thereby throwing the drop at the exchange.
2. The calling subscriber takes the receiver off the automatic switch-hook.
3. The operator plugs into the answering jack, and
4. Replaces the line drop shutter.
5. The operator, having got the number wanted, plugs into the multiple jack, and
6. Rings the called subscriber.
7. Conversation finished, both subscribers replace their receivers on the automatic switch-hooks and
8. Turn their magneto generators, thereby throwing the clearing-out drop.
9. The operator listens in to make sure that disconnection is required, and, such being the case,
10. Pulls out the two plugs, and, finally,
11. Replaces the clearing-out drop shutter.

In different companies and administrations different methods of operating obtain, and there are minor variations from the above series of operations, dependent largely on the efficiency of the users of the service as operators of their end of the system. But the essential steps in the operation of a connection with the series-multiple board described in the body of this book are those set forth above, with the possible exception of No. 9, which is not everywhere regarded as essential, though for good service it should be.

An examination of these steps will show which are absolutely requisite and which may be done by automatic means as a secondary result of a requisite step.

Step No. 2 has for its object switching the line from the subscriber's bell, its normal connection, to the talking circuit of his instrument, and, incidentally, closing the battery circuit of the transmitter. This is a requisite step in order to change the telephone station from its normal position of readiness to receive a signal from the exchange to the condition of readiness for talking over the line.

Step No. 1 has for its object to signal the exchange for attention. It is quite obvious that step No. 2 may, by the movement of the automatic switch, be made to effect the purpose of step No. 1, at the same time that it switches the line from the bell to the talking circuit. Similarly, step No. 7, which is the converse of step No. 2, may be made to effect the object of step No. 8, the sending of a signal for disconnection to the exchange. Here is gained two operations out of four performed by the subscriber. The British Post-office has for many years had a system in operation embodying these features. The indicator at the central office is a galvanometer, whose needle is normally inclined at one side. Lifting the telephone from the hook at the subscriber's station sends the needle over, indicating a call. When the connection is made the needle falls to zero, affording a visual busy test, and when the two subscribers hang up the needle is inclined in an opposite direction to the normal position, thereby affording a disconnection signal. Consequently there is no radical change in combining steps 1 and 2 into one operation, and step 7 and 8 into one operation.

¹ Abstract from new edition of "Telephone Handbook" Electrician Publishing Company (Chicago), now in press.

Turning to the exchange end we find that the essential operation of plugging into the answering jack (step 3) is capable of accomplishing the work of step 4, and that either step 9, which is not essential, or step 10, which is, may similarly be made to do the work of step 11. It must be observed here that a system in which the removing of the telephone from the hook sends a signal to the exchange, and the replacing of the telephone sends another signal, necessarily involves the use of signaling devices at the exchange which are entirely automatic (as far as any separate movements on the part of the operator to restore them are concerned), and such a system therefore abolishes steps 4 and 11.

The automatic features bring the essential operations in a telephone connection from 11 down to six, as follows:

1. The calling subscriber takes the receiver off the hook, thereby signaling the exchange and switching his line from the bell to the talking circuit as usual.
2. The operator plugs into the answering jack, thereby resetting the line signal and getting into communication with the calling subscriber as usual.
3. The operator plugs into the multiple jack.
4. The operator rings the called subscriber.
5. Conversation ended, the two subscribers hang up their receivers, thereby displaying a disconnection signal at the exchange.
6. The operator pulls out the two plugs, thereby resetting the disconnection signal.

The operations are cut down from a total of 11 to a total of six, or a little more than half. The operations required of the subscribers are cut down from four to two, and those of the operator from seven to four. Step 9 in the first series becomes no longer necessary when the disconnection signal indubitably means that the two subscribers connected have hung their telephones on their respective hooks and left them there. Such a disconnection signal is unmistakable and requires no supervision by listening-in; where the disconnection signal is by a drop actuated by a magneto generator, its falling may not always mean a signal for disconnection, and listening-in to make sure of the subscriber's intentions is a part of good service.

New England Telephone Notes.

[From the Boston correspondent of the WESTERN ELECTRICIAN.]

The New England Telephone and Telegraph company has adopted a revised schedule of charges for the use of the telephone at pay stations within what is termed the Boston and suburban district. The rate heretofore has been 15 cents for five minutes' use of the telephone. The new rate will be 10 cents for three minutes, and five cents extra for every additional three minutes of conversation.

The telephone privilege for the new Southern Union Station in Boston has been leased to the New England company, and it has been arranged to have eight booths in a special room adjacent to the ticket offices.

A feature of the banquet of the Pine Tree State club at the Hotel Brunswick in Boston on the evening of January 24th was the introduction of the telephone-connection idea in receiving messages from members and distinguished Maine citizens at several points. To Speaker Thomas B. Reed, Secretary John D. Long, Senator Frye, Governor Powers of Maine, Congressman Boutelle and other men of note messages were sent over the wire from the banquet hall, and their replies were heard by the participants at the tables, although circumstances were such that only in the case of the message from Professor Albion W. Small of the University of Chicago was the conversation personally given. The telephone attendants, however, at Washington and other places made the connecting link satisfactorily and demonstrated the practicability and novelty of the event. Upward of 75 transmitters were used. The music for the evening was furnished by the orchestra in the Schlitz Hotel, at Milwaukee, Wis., transmitted over the wires of the long-distance company to Boston.

EXTENSIONS AND IMPROVEMENTS.

The manager of the Blue Mountain telephone line says that an exchange will be put in at Long Creek, Ore., soon.

The Victoria (B. C.) and Esquimalt Telephone company is about to make improvements. A metallic circuit will be installed.

The Snowshoe company will begin immediately to construct a telephone line to connect its mine near Anaconda, Mont., with Libby, a distance of 15 miles.

C. W. Winter and J. B. Slater have been granted a franchise to construct and maintain lines of telephone and telegraph on public ways of Stevens County, Wash.

Among the recently licensed Illinois corporations was the Ohio Telephone company, whose capital is placed at \$500, and whose object is to operate telephone exchanges in counties of Lee and Bureau. The incorporators are R. F. Spencer, M. E. Cadwallader and J. P. Barnham.

Telephone Ordinance Vetoed.

Mayor Harrison on Monday night vetoed the ordinance of the Chicago City Council granting the Illinois Telephone and Telegraph company a franchise to build and operate a telephone exchange system in this city, and the action of the mayor was sustained by the council.

Mayor Harrison's objections were based upon the loose manner in which the ordinance was drawn, some of the provisions contained in it, and the hasty manner in which the aldermen put the measure through the council. He took occasion, however, to express his sympathy with the object of the movement which culminated in this ordinance, and volunteered his assistance and support in the enactment of a properly prepared measure to accomplish a reduction of telephone charges.

"There is no question of the public desiring relief from the present monopoly, with its exorbitant charges and absolute disregard of the rights of those who make its franchise valuable," said the mayor in discussing this point, and he added: "Personally I am willing to render any proper assistance in drawing up an ordinance that will give proper protection to the people. I regret that the present ordinance is so drawn as to force me to withhold my approval from it."

The reasons assigned by the mayor for vetoing the measure may be summarized as follows:

It fails to specify the time in which the plant is to be completed and in operation, or to provide for a bond conditioned on such completion.

It grants the right to open all streets to lay conduits, while, in the opinion of the mayor, some restriction should be made in order to protect improved streets from being unnecessarily torn up.

The section allowing the company to bring its wires to the surface at every block, joined to the other one, allowing it to string for four blocks overhead, gives an opportunity to evade the section providing for the burying of the wires in a large portion of the city.

It does not provide for complete metallic circuits, which the mayor considers necessary for good telephone service.

It does not give the city the right to use the poles and conduits of the company for its own wires.

Fifty years is altogether too long for the franchise to live, in the opinion of the mayor, and a clause should be inserted providing for the purchase of the plant by the city at a valuation of its tangible property after the franchise has expired.

There should be some provision for compensation to the city after ten years have expired.

The mayor is particularly severe upon the aldermen who rushed the measure through the council without giving opportunity for proper consideration and discussion. The language of the message is very explicit upon this point, as will be seen from the following extract: "In this connection I would call the attention of your honorable body to the objectionable consequences of passing an ordinance of such great importance in a single meeting. I feel certain, from conversations I have had with some of the gentlemen connected with the present ordinance, many of the objections I have mentioned could have been avoided had the ordinance and the amendments offered been laid over for a week, that thorough consideration could have been given the subject. With the suggestions I have mentioned the present would be a good ordinance and acceptable, in my opinion, to the citizens."

It is understood that another ordinance will be prepared and introduced embodying the features covered in the mayor's message. Commenting upon the possibility of relief under this proceeding, the Chicago Tribune says editorially:

The suggestions made by the mayor are not objectionable, as far as is known, to the persons who wish to go into the telephone business. If that is the case doubtless they can get their ordinance without difficulty and try their hand at fighting the old company. They ought to have patronage enough if they combine low rates and good service.

Proposed Extension of Chicago Telephone Company's Franchise.

It is announced that the Chicago Telephone company will ask the City Council for an extension of the franchise privileges for a term of 50 years. The company's present ordinance was passed on January 4, 1889, and was for a term of 20 years. It has therefore 10 years to run, but, owing to the threatened competition, the company has determined to bring the matter up at once in the hope of getting the subject settled before its present franchise expires. In view of the attitude of Mayor Harrison toward the Illinois Telephone and Telegraph company, it is hardly to be expected that the old company's petition will be favorably acted upon.

The trustees of Albuquerque, N. M., received sealed propositions from Peter Wehner of El Paso, Texas, and J. J. Cooper of Trinidad, Colo., for putting in an electric-light plant. Neither was accepted, but Mr. Cooper's was regarded as the better of the two. An ordinance was formed fixing maximum rates and other details governing the establishment of a plant and mailed to Mr. Cooper. If he accepts the terms an ordinance will be passed.

Michigan Telephone War.

[From the Detroit correspondent of the WESTERN ELECTRICIAN.]

Charles J. Glidden, the new president of the Michigan Telephone company, and a number of the members of the board of directors have been making an extensive tour of the state, with a view of thoroughly reorganizing the forces of the company and improving the service. Mr. Glidden has already made a number of changes in the officers of the company. Frederick A. Forbes is the general manager of the new company; James F. Land, formerly general superintendent, becomes assistant general manager; Charles H. Seitz, manager, becomes general superintendent of the central division, and the remaining three of the four districts into which Michigan has been divided will be supervised as follows: Southern district, C. E. Wilde, Kalamazoo, general superintendent; western district, W. J. Barry, Grand Rapids, general superintendent; northern district, George D. Sheiman, Marquette, general superintendent.

President Glidden expresses satisfaction with the condition of affairs. While in Detroit the party took carriages and looked over the sites for five new branch exchanges to be erected in Detroit. Specifications and contracts for the buildings will be drawn up at once.

One of the steps of the company in its preparations for the telephone war will be to build and equip its lines in the most approved manner. It has been practically decided to build another story to the present telephone building to permit the installation of a common-battery system. A wire north to Menominee is also to be started. Part of the line-construction crew is already in Detroit, and the work will be commenced as soon as the rest arrives.

The telephone war in Michigan is on in earnest. "I expect," said an officer of the Bell company, "that in six months we shall be in a position to handle 150,000 calls in Detroit per day. Experience has taught telephone men that with every improvement there has been a big jump in the number of calls. In other words, the number of calls is regulated by the capacity of the exchange to give good service, and if the service is first-class a subscriber will go over the ground by sitting still and using the telephone, putting in call after call as fast as one can count. In Cleveland, where they have the latest appliances in switching apparatus, the last count, taken a couple of weeks ago, showed 110,000 calls in one day. In the spring, when navigation opens, this will doubtless jump up to 135,000 daily, while the exchange could take care of 150,000 without trouble. Detroit, with the improvements decided upon, will be able to handle even more calls than Cleveland."

The Michigan Telephone company has made arrangements to install in the main and branch exchanges in Detroit the latest pattern of "relay" boards, such as are in use in Cleveland. President Glidden and his associates have decided to spend between \$300,000 and \$400,000 on the Detroit plant. Of this amount \$200,000 will go into new switchboards.

The new switchboard will employ luminous signals at the exchange and afford what is known as "express" service. Under this system, when the subscriber takes the receiver off the hook a tiny incandescent lamp lights up in front of the operator and continues to burn until the operator answers. When connection is made another lamp, corresponding to the line called for, flashes up and continues to burn until the subscriber answers. When the conversation is finished a pair of lights flash up and burn until the operator disconnects the lines. The signaling is all automatic. There is no ringing to get the exchange and no ringing off.

One unique feature of this system is that lines out of order will show it by the burning of these tiny lamps, so that when a line is "out" there is a steady reminder in front of the operator and the inspectors. The result of this system is not only improved service, but disconnections are made so promptly that the capacity of each line is increased.

The Michigan company's Detroit exchange was completed less than four years ago, and when it was transferred to the new telephone building on Clifford street telephone experts pronounced the equipment the finest in the country. President Glidden has decided to have this changed. The Detroit plant will use about 9,000 miniature incandescent lamps.

Consolidation of Bell Interests.

The report that the American Bell Telephone company contemplates a union of all the Bell properties of the country finds many believers. One of the largest holders of Bell securities is quoted by the Boston News Bureau as saying: "I know that it was contemplated at one time to consolidate all the companies so that the Bell people could make an unlimited service at, say, \$600 or \$800 a year to cover the whole country. The ideal situation that Bell people were striving for was to have a telephone on the desk of every business man, by which he could talk with anybody in the United States at no charge beyond an annual rental, and at one time it was thought that \$600 per annum would be sufficient to cover such a service."

The following statement, which appeared in the same journal, is probably given out with the view of

ascertaining the reception such a plan would receive:

Soon after the formation of the American Telephone and Telegraph company (the long-distance company) it was generally known and believed that the object of the company was not only to build long-distance lines, but to take in all of the sub-companies. That plan is now rapidly maturing, and in all probability the American Bell company will be merged into the American Telephone and Telegraph company of New York. Bell stockholders will be asked to accept shares of that company in exchange for their shares on a satisfactory basis as regards the earning power of the two companies. After this is adjusted all the sub-companies' stockholders, especially where the American Bell company now owns a controlling interest, will be offered the stock of the American Telephone company upon an earning basis in exchange for their stock in the sub-companies. In companies where the American Bell company does not own a majority interest it will purchase the control, so as to bring about a grand consolidation of all interests. When this plan, which is quite feasible, is consummated the American Telephone and Telegraph company will be the largest corporation in the world. There appears to those best informed to be no opposition to the plan as outlined. The Cleveland Telephone company, it will be remembered, recently purchased the Michigan Telephone company. Both these companies are controlled by the American Bell Telephone company, as are the Chicago Telephone and Central Union Telephone companies. Therefore, a consolidation of the American Bell Telephone company with another concern would mean the virtual absorption of the smaller concerns mentioned by a great corporation.

The Erie telephone management was formally elected by the board of directors of the Michigan Telephone company as managers of the property on January 18th. Ashley Pond of Detroit resigned as director and Charles J. Glidden was elected to fill the vacancy. The board as reorganized is as follows: President, Charles J. Glidden of Lowell, Mass.; vice-president, James P. McKinstry of Cleveland, O.; secretary, George B. Perham of Lowell, Mass.; treasurer, Charles A. Grant of Lowell, Mass.; general manager, Frederick A. Forbes of Detroit; local treasurer, Hugh McMillan of Detroit. The advisory committee consists of the board of managers of the Erie company residents of New England and New York.

The following-named directors of the Michigan Telephone company will remain on the board of directors: Robert T. Lincoln, president Pullman's Palace Car company; Colonel Robert C. Clowry, vice-president Western Union Telegraph company; W. A. Jackson, president Central Union Telephone company, and Norman Williams of Chicago, Frederick A. Forbes and Hugh McMillan of Detroit.

Telephone News from the Northwest.

[From the Minneapolis correspondent of the WESTERN ELECTRICIAN.]

Senator E. E. Smith's bill in the Minnesota Legislature for allowing telephone companies to acquire a right-of-way along railroad rights-of-way has been recommended for passage. A bill has been introduced to make telephone companies common carriers and requiring them to transmit, without discrimination, messages from other companies at the rate charged individuals. The companies are placed under the Railroad and Warehouse Commission.

Work has been started on a local telephone system at North Branch, Minn.

The Northwestern Telephone Exchange company has reduced rates at St. Cloud, Minn.

The council of Duluth, Minn., has appointed a committee to ascertain the cost of a municipal telephone system.

Mekinock, N. D., has petitioned the Northwestern Telephone Exchange company to give it toll connection with Grand Forks, N. D.

The Lake Park and Ulen Telephone company has been formed at Lake Park, Minn., to build a line to Ulen.

Local stockholders of the Minnesota Mutual Telephone company at Wyoming, Minn., have decided to employ an attorney to investigate the business of the company.

The Ranch Telephone company has been formed at Chadron, Neb., to build a toll system in that vicinity. It will tap all the towns from Chadron to Gordon and Ellsworth, and will construct 300 miles of line.

The Cedar Valley Telephone company is an applicant for a franchise at Ackley, Ia.

A telephone line has been completed between Confidence and Plano, Ia.

The Perry Telephone company is putting in an exchange at Stuart, Ia.

The new exchange at Manson, Ia., has been completed and put in operation.

Oto, Ia., has voted a franchise to the Iowa Telephone company.

There is talk of a telephone line from Exira, Ia., to Audubon, to connect with the system in the latter place.

The telephone system at Lewistown, Mont., has ordered an additional switchboard with 50 drops.

Citizens of St. Paul are intensely disgusted at the way their city is mentioned in the long-distance telephone directory. The council there has refused a franchise to the long-distance company and so the city is noted as being "near Minneapolis."

The Northwestern Telephone Exchange company will rebuild the exchange at Grand Forks, N. D., at a cost of \$12,000.

The Central Telephone company is an applicant for a franchise at Monroe, Ia. The citizens will vote on the matter March 20th.

Sullivan & Still contemplate putting in an exchange at Garden Grove, Ia.

The town of Mount Ayr, Ia., will vote March 20th on the applications of three telephone companies for franchises, viz.: the Iowa Telephone company,

the Clearfield and Mount Ayr Telephone company, and the Mount Ayr Mutual Telephone company.

P. J. Menard proposes to establish a telephone exchange at Mantowoc, Wis., if he can get a franchise.

A new telephone exchange is being installed at Wheaton, Minn.

The Iowa Telephone company has made out rates for telephone service at Fort Dodge, Ia.

The Standard Telephone company has been annoyed by some unprincipled rascal cutting out the current by running a fine copper wire down the pole and into the ground. This has been done in the country and required the examination of each pole to discover the trouble. The work was done near Elkader, Ia.

G. E. Bickley and J. W. Knepper of Waterloo, Ia., have secured control of the telephone exchange at Oelwein, Ia., and will entirely rebuild the system.

The Independent Telephone association of Iowa held a meeting in Des Moines recently and discussed plans to prevent other independent companies from selling out to the Bell interests, as two in the northeastern part of the state recently did.

The La Crosse (Wis.) Telephone company has added 118 subscribers to its system in the last year. The company is preparing for numerous improvements the coming season.

The Assembly in St. Paul has passed a resolution calling on the Mississippi Valley Telephone company for a statement of the work it has done in the city and the sums expended for labor and materials.

The Elgin (Minn.) Telephone company is planning a number of extensions to its system for the coming season.

J. E. Gipson is canvassing Mandan, N. D., with a view to putting in a local telephone exchange.

The Elgin Telephone company of Elgin, Minn., has had a successful year and is planning a number of extensions for the coming year.

The McCormack Telephone company is an applicant at Ely, Minn., for a local telephone franchise.

Over \$500 of the required \$700 has been raised at Lake Park, Minn., for the construction of the proposed telephone line to Ulen, Minn.

The council of Duluth, Minn., has received two bids for a telephone franchise in that city from R. H. Evans, a promoter of Detroit, Mich. The Duluth Telephone company presented a communication relating that it has been in operation for 20 years satisfactorily, and that it can undoubtedly maintain its right to continue. It points out the injury of having two exchanges in operation and expresses a hope for an amicable agreement with the city.

Auditor Dunn of Minnesota recommends a return to the system of taxing telephone companies on their plant valuations instead of on gross earnings as at present. He says they do not bear their share of taxation.

McIntire, Ia., says it has good service over the wires of the Northwestern Telephone Exchange company, but complains that connection with Osage, Ia., is slow, roundabout and uncertain.

The Oliver Iron Mine company will soon construct a telephone line between its three properties on the Vermillion iron range in Minnesota, the Zenith, Pioneer and Savoy.

The Mesaba Telephone company has completed an exchange at Sparta, Minn. It includes Eveleth and Virginia, Minn., in its connections.

The Pierce County Telephone company has made many improvements to its system in Ellsworth and River Falls, Wis., and will make connection with St. Paul and Minneapolis in the spring.

The Northeastern Telephone company held its annual meeting at Rush City, Minn., recently. The company has 50 miles of wire in operation.

A right-of-way has been secured for a telephone line from Fergus Falls, Minn., to Wadena, Minn.

Slayton, Minn., is to have telephone connection by spring.

The Union Telephone company of Plainfield, Wis., has arranged to extend a line to Stevens Point, Wis., 23 miles.

The Iowa Telephone company plans to make many changes and improvements to its system in Iowa in 1899. The copper metallic return circuit will be extended freely, and new toll lines across the state from Council Bluffs to Sioux City, and thence to Dubuque, will probably be built.

Harlan, Ia., is to have connection with Exira in the spring.

Judge S. M. Elwood is an applicant for a telephone franchise at Sac City, Ia. The matter will be voted on at the spring election.

The Knoxville Electric company of Knoxville, Ia., has completed connection with Des Moines, and is preparing to reach Okaloosa, Ia., in the spring.

The Standard Telephone company of Waukon, Ia., has increased its capital stock from \$25,000 to \$50,000. A 20 per cent. dividend was declared.

Larkin & Coffey have sold the telephone system at Madison, S. D., to Aeksett & Gray of Harmony, Minn., who will improve and extend the service.

The annual meeting of the Wood County Telephone company at Grand Rapids, Wis., shows the company to be out of debt and earning dividends.

Sleet and ice on the wires at Morris, Minn., did about \$500 worth of damage to the telephone system recently.

The Central Telephone company is willing to put in an exchange at Pella, Ia., if the business will warrant.

A bill has been introduced in the Minnesota Sen-

ate providing for the taxation of telephone, telegraph, express and other companies under the Ohio plan, which is to assess them at the proportion of their capital stock, as their total property value is to their total actual property value.

Merchants of Cedar and Wright, Ia., are arranging to construct a telephone line to Oskaloosa.

The Chippewa Falls Telephone company of Chippewa Falls, Wis., held its annual meeting recently. The company is in good condition and has over 200 instruments in use.

P. B. Hirsch, superintendent of the Wausau (Wis.) Telephone company, was married recently to Miss Belle Holderman.

The Wisconsin Telephone company has met the rate made by the People's company at Waupun, Wis., of \$1 per month.

A bill will be introduced in the Legislature to permit Duluth, Minn., to construct a municipal telephone system.

The Wisconsin Valley Telephone company held its annual meeting at Eau Claire, Wis., recently. The company has 900 miles of line in operation. The company voted to issue no more passes.

The Merrill (Wis.) Telephone company has increased its list of subscribers 66 in the last year. It is proposed to extend toll lines to a number of towns in the vicinity this spring.

Charles McFatrige has sold his telephone line between Moravia, Ia., and Blakesburg to the Ottumwa Telephone company.

The Mutual Telephone company of Des Moines, Ia., has ordered a 200-drop switchboard.

J. M. Baker, general manager of the Iowa Telephone company, died recently at his old home in Hudson, Mich.

There is talk of forming a mutual company to purchase the telephone exchange at Mount Ayr, Ia. Mutual companies expect to have exchanges in nearly every town of Iowa of 3,000 population by the end of the year.

The Moline, Ill., telephone exchange gave a telephone concert recently to the patients of the city hospital. The occasion was the appearance of Blatchford Kavanaugh, and a receiver was placed at the cot of each inmate of the hospital.

Stillwater, Minn., now has 240 telephones in use. The number has increased recently, owing to a reduction in rates.

The Iowa Telephone company gave bulletins of the progress of the McCoy-Sharkey prize-fight to people in Iowa.

Direct-reading Ohmmeter.

The accompanying cut illustrates the latest production of the American Electric Specialty company of 123 Liberty street, New York. It is the company's '99 type of direct-reading ohmmeter. The instrument was produced by the company for the purpose of measuring resistance in much the same way that a voltmeter measures volts and an ammeter measures amperes, and to meet the demands of practical men. It is portable, direct-reading, accurate and self-contained, and is a reasonably cheap instrument. It takes the place of the portable testing set, over which it possesses many advantages.

Being direct-reading, it thus eliminates the mistakes that are liable to be made when making the necessary calculations from plug readings. The telephone receiver renders it independent of leveling, of stray magnetic fields and of vibration.

The direct-reading ohmmeters are always ready for service without any previous adjustment. The instrument carries its own battery, which will last from six months to a year with constant use, and can be renewed at a price which compares favorably with the cost of renewing of chloride-silver cells of portable testing sets. The instrument is so simple that a boy, after a few moments' instruction, can obtain as accurate results as an expert.

The operation is as follows: Connect the resistance to be found to the binding-posts marked *XX* and place the telephone to the ear, pressing forward the key marked *K*. This closes the battery circuit. The stylus is then taken in the hand in the same manner as a pen. The two outside binding-posts are first successively touched with the stylus. The point of silence, which is the point desired, is on that half of the scale which gives the faintest click. The other end of the half thus found is then touched, and if less sound is heard there, the point of silence is nearest that end. This divides the portion of the scale to be searched by four. Over the fourth thus determined touch the wire until the point of silence is found, when the scale beneath is read directly. The scale is lettered in three or four colors, according to the grade of the instrument, and on the center block of the ohmmeter is provided a small number of plug holes which are correspondingly colored. This device provides a large range. If the plug is in the hole of a certain color, the corresponding figures are read, thus avoiding multipliers, which confuse the inexperienced man.

So rapidly can this point of silence be located that a resistance is found in an almost inappreciable length of time. The instrument is 17 inches long, five inches wide and 4½ inches high and weighs about 7½ pounds. It is made of polished mahogany with mottled joints, and can stand a great deal of rough usage. It contains a small compartment in one end for storing away the telephone. The middle strip is of polished hard rubber; the brass-work is machine-finished and highly lacquered.

Every precaution has been taken to make the instrument extremely high-grade, simple and practical. The instrument has four scales, lettered in black, red, blue and brown. The black scale reads from zero to 10 ohms, the red scale reads from zero to 100 ohms, the blue from zero to 1,000 ohms and the brown from zero to two megohms, thus giving the instrument a very wide range over a considerable length of scale, enabling very accurate readings to be obtained.

This device has found particular favor among electricians and experts who are frequently called upon to run down faults in cables or lines and similar troubles in electric-light, telephone and telegraph stations. The company reports a large and growing demand for it.

American Institute of Electrical Engineers.

At the meeting of the Institute in New York on January 25th a paper was presented by Lieut. S. Dana Greene of Schenectady entitled "Electricity on Shipboard." It was discussed by Captain Millis, Lieutenant Walling, J. W. Lieb, Jr., T. C. Martin, Elihu Thomson, Townsend Wolcott and others.

At the meeting of the executive committee in the afternoon the following-named associate members were elected: Royal Bradford Daggett, Chicago, Ill.; Ernest J. Dyer, Yokohama, Japan; Geo. Henry Hill, New York city; Ernest Rowland Hill, Pittsburg, Pa.; Wm. A. Lynn, Berkeley, Cal.; J. Manley Simpson, St. Paul, Minn.; Thos. Perrin Thompson, Brooklyn, N. Y.; Alfred J. Thompson, Havana, Cuba; Robert M. Wilson, Montreal, Que.

The following-named associate members were transferred to full membership: Philander Betts, Washington, D. C.; Winder Elwell Goldsborough, Lafayette, Ind.

Amended Porto Rican Tariff.

The United States Treasury Department announces that the port of San Juan is the chief cus-

Underground-contact System Said to Be Practicable for Chicago Street Railways.

The position taken by the street-railway companies of Chicago, which are seeking overhead trolley extensions in the central business district, that it is impracticable to operate the "underground-trolley" system in Chicago, owing to poor drainage, bad pavements and the dirty condition of the streets, is combatted by City Electrician Ellicott, Lieutenant F. B. Badt and others. Mr. Ellicott has made a report to the mayor, in which he takes the ground that the proposed system of underground conductors is perfectly feasible. On the subject of drainage the city electrician remarks that North Clark, Wells, La Salle and Dearborn streets have sewers from nine to 11 feet below the street surface, and that all of the business district is equally well drained.

Some of the other points made by Mr. Ellicott are given:

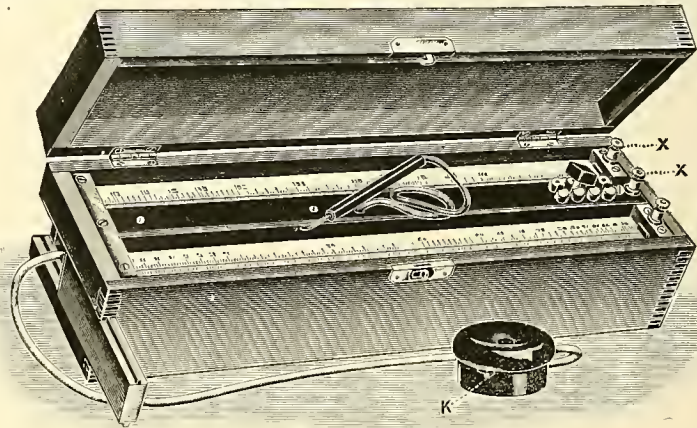
Numerous catch-basins are connected to these sewers, and in any case except a flood there is certainly capacity enough to carry all surface water away, and the surface water is all we have to deal with. Assuming that water should at some time run into the conduit—is it not more than large enough to carry off all the water that could possibly run through the slot—there is no danger of its entering through any other opening, as none exists.

And why cannot the water that does flow through the slot follow along the bottom of the conduit to suitably arranged catch-basins and from them to sewers, or, if the fall is not sufficient, why not force the water by means of pumps into the sewers?

The telephone company, Edison company and the city of Chicago have built hundreds of manholes in different parts of the city, varying in depth from five to eight feet; they do not make any other provision for draining them than to connect with the sewer, and at no time are they unable to do work in them on account of water. The cable conduits are not so deep as these manholes, and consequently less likely to be improperly drained if connected to the sewers.

The sewers cannot back water into the manholes, as traps are provided to prevent it. There might be a combination of circumstances that would temporarily interfere with the underground service, but such a condition would probably cause the same interference with any system of electric traction.

Only last year the city of Chicago, poor as it is, incurred the expense of placing its own wires underground in North Wells street. Only a few small wires were maintained and a single line of poles on each street, but they had to come down—the peo-



DIRECT-READING OHMMETER.

ports of Porto Rico, with the following as sub-ports: Ponce, Mayaguez, Aricibo, Aguadilla, Humacao, Fajardo, Isabel Segundo, Naguabo, Arroyo and Jobos. Any controversy arising at any of the sub-ports is referred to the collector at San Juan for settlement.

All trade between Porto Rican ports and those of the United States must be carried in registered American vessels, and any merchandise transported otherwise is subject to forfeiture.

On and after February 1, 1899, the Porto Rican or Spanish silver coins now in circulation in the island of Porto Rico shall be received for customs duties at the following rates: Peso, 60 cents; medio peso, 30 cents; peseta, 12 cents; real, six cents; medio real, three cents.

Some items of the amended tariff are as follows: Incandescent electric lamps, mounted or not, \$2 a hundred; wire, covered with tissues or insulating materials, conducting cables for electricity over public thoroughfares, \$6 per 100 kilogrammes (this is construed to mean cables composed of one or more wires of copper or an alloy of copper, whatever be their thickness, providing that they be covered with an insulated wrapper, without taking into consideration whether they are enclosed in pipes of iron or lead or strengthened with cordage or iron or steel wire); carbons, prepared for electric lighting, \$2 per 100 kilogrammes, gross weight; dynamo-electric machines, electric motors and all other electric machines and apparatus, 15 per cent. ad valorem.

New "Interrupted-current" Dynamo.

In the article describing the new "interrupted-current" dynamo of the Triumph Electric company, given in the *WESTERN ELECTRICIAN* last week, it was stated that "This dynamo, the maker claims, * * * will develop current for the same number of lights with the expenditure of only 35 per cent. of the energy required with any other machine." The figure should have been 65 per cent. instead of 35 per cent. A slip of the pen in the statement of the manufacturer is accountable for the unintentional error.

ple demanded it—and now the proposition is to put up twice as many poles, equipped with bare wires, bringing about a dangerous and undesirable condition of affairs (taking a step backward instead of forward, and all for the sole reason of saving a few thousand dollars to a street-railway company.

Walker Street-car Motor Declared to Be Non-infringing.

Judges Colt, Webb and Brown in the United States Circuit Court of Appeals at Boston, January 26th, rendered a decision in the case of the Thomson-Houston Electric company against the Athol and Orange Street Railway company, affirming the decree of the Circuit Court dismissing the plaintiff's bill. The suit was brought for an injunction to restrain the defendant from the alleged infringement of patent No. 448,260, issued on March 17, 1891, to Edwin W. Rice, Jr., for an electric motor. The motor is used on electric cars. The defendant company is using the Walker motor, which is constructed under the Uebelacker patent, No. 554,353, dated February 11, 1896, and the Short patent, No. 546,360, dated September 17, 1895.

The opinion of the Appellate Court, which was written by Judge Colt, reviewed the claims of the patents of both parties at length, and holds "that in construction and mode of operation the Walker motor is distinctly different from that described in the Rice patent, and that it does not infringe any of the claims relied upon by the complainant." F. P. Fish and J. J. Storrow appeared for the complainant and C. E. Mitchell for the defendant.

The Union Copper Mining company of Roselle, N. J., was incorporated on January 27th, with an authorized capital of \$3,000,000, of which \$2,500,000 is paid in. The incorporators are William G. Newman, Walter G. Newman and Byron P. Stratton of New York and Temple Taylor Berden of Roselle. The company will conduct a general mining business and will purchase and operate copper and zinc mines in different parts of the country.

INDUSTRIAL COMBINATIONS.

A bill has been introduced into the New Hampshire Legislature to consolidate the Exeter railway, the Hampton and Amesbury railway and the Rockingham Electric company into one large electric-railway system. It was this project that gave rise, a short time ago, to the rumor that a scheme to parallel the Boston and Maine steam railroad all along the coast, and connect the beaches, from Boston to Portland, was in contemplation.

It is reported from Taunton, Mass., that a street-railway consolidation deal is under way in the southern part of the state, by which the Shaw syndicate, now operating the railway between Brockton and Taunton and the line between Taunton and Providence, is to come into control of systems valued at several millions of dollars. These include the Taunton street railway, the Dighton, Somerset and Swansea railway, the Globe street railway of Fall River and the Fall River and Newport railway.

The directors of the new American Steel and Wire company of New Jersey have elected officers for the coming year as follows: Chairman of the board, John W. Gates; president, John Lambert; first vice-president, William Edenborn; second vice-president, I. L. Ellwood; third vice-president, S. H. Chishelm; fourth vice-president, P. W. Moen; treasurer, W. A. Green; assistant treasurer, F. L. Watson, Chicago; assistant treasurer, T. P. Alder, New York; secretary, C. S. Roberts; assistant secretary, O. Owen, Chicago; assistant secretary, F. E. Patterson, New York; executive committee, I. L. Ellwood, J. W. Gates and William Edenborn; general counsel, Seward, Guthrie & Steele.

The combination of street-railway interests in St. Louis was strengthened by the recent sale of the Union Depot system. The papers were signed and the deal arranged about two weeks ago in New York city. James Campbell of St. Louis, a heavy stockholder, and Harry Scullin, vice-president of the company, conducted the negotiations for the St. Louis people, while P. Calhoun represented Brown Brothers. The deal was negotiated on a basis of \$136.66 a share (par value \$100), or a total of \$4,100,000. This will give the syndicate represented by Brown Brothers control of 180 miles of road. It is believed that the Southern Electric and Hamilton system of roads will be absorbed by the syndicate. H. Sellers McKee of Pittsburg has sold his traction franchise to Brown Brothers, which gives them possession of fully two-thirds of the street-car mileage of St. Louis.

A Baltimore dispatch of last Saturday states that the syndicate formed by Alexander Brown & Sons for the purpose of consolidating the street railways of Baltimore will also engage in electric lighting. It has not been decided whether the syndicate will absorb the electric-light companies now in existence or use its own plant to furnish the power. Existing companies are the Brush Electric company, the Edison Electric Illuminating company and the Northern Electric company. The combined gross earnings of the properties amount to about \$620,000 yearly, and the net earnings to about \$233,000. The plan of financing the United Railroads and Electric company of Baltimore, which is the name of the corporation that will take over the street-railway properties, will be large enough to cover the cost of the three electric-light companies, should it be decided to acquire them instead of using the railway power houses of the company to furnish electricity for lighting purposes. The plant of the company is ample for the purposes, but it is held that it would be more profitable to have all the electric companies under one management.

On January 27th there was filed in Jersey City the certificate of incorporation of the Miners' Copper company, a new combination of copper interests, with \$10,000,000 capital. The significance of this incorporation, says the *Chicago Tribune*, is greater than appears upon the surface. The Miners' Copper company is said to be only one of six copper corporations, the remaining five being not yet formed, each of which is to have \$10,000,000 capital and is to pass over its control to the Miners' company, giving that company's stock the same relative value as the preferred stock in a larger company. The incorporators of the Miners' Copper company are Frederick Buckley Hyde of Boston and George W. Mark and James B. Dill of New York. The company incorporated is believed to be a rival of the real copper trust, which has been in process of formation for some weeks. It is known that the copper interests, which include the Boston and Montana, Butte and Boston, Montana Ore Purchasing, the Tamarack, the Osceola and the Quincy Copper Mining companies, have thus far not completed arrangements for a consolidation. It is, however, possible that the new company may be a dummy, which will eventually play into the hands of the real trust when it is an accomplished fact. In this view it is probable the Miners' Copper company will bear the same relation to the copper trust as the Union Investment company does to the Standard Oil trust. It will hold as trustee the stock of the various subsidiary companies controlled.

The Washington and University Railroad company is again before Congress for the additional privilege of extending its lines over some streets not mentioned in its bill of incorporation.

CORRESPONDENCE.

New York Notes.

NEW YORK, January 30.—The Rapid Transit Commission has memorialized the Legislature for an enlargement of its powers, in order that it may resort to new financial expedients for building the proposed underground system of railways in this city. In the memorial various plans of financing the great undertaking are discussed, whether by pledging the public credit or by the employment of private capital. The commissioners recommend that if power is granted them to sell the franchise to construct the road, such power shall be additional to their present powers and not a substitute for them. In this way the board will be enabled to take advantage of varying conditions as they may arise in the future. "If the city authorities shall see their way to keep the debt sufficiently within constitutional limitation," say the memorialists, "then the board will be in the position to authorize municipal construction; and, on the other hand, if municipal construction shall prove to be constitutionally impracticable within any reasonable time, the board may be enabled to arrange for construction by private capital." The commissioners point out that the testimony taken before the two Supreme Court commissions and the striking success of the subway in Boston have removed any doubts which formerly existed as to the practicability of such a road and as to the possibility of calculating the cost.

It is said that the Manhattan elevated-railway directors, at their meeting on Tuesday, discussed in detail the question of ways and means for providing the money necessary for equipping the elevated-railway system with electricity, and came to an agreement that an issue of stock would be advisable, all stockholders to have the privilege of subscribing pro rata to the new issue at a fixed price, and that an underwriting syndicate made up of large Manhattan interests should be formed for the purpose of taking such part of the new stock as might not be subscribed for by the stockholders. As shown by the interview which I quoted last week, Russell Sage has taken an extremely conservative position in relation to the proposed change. It is reported that the other directors, including Mr. Gould, are inclined to be more progressive, and it is hoped that Mr. Sage's influence may be overborne.

George H. Pegram has been appointed chief engineer of the Manhattan Railway company, and John Waterhouse, formerly chief engineer, has been appointed consulting engineer of the system. Mr. Pegram, who was formerly connected with the Union Pacific, entered the service of the Manhattan company as consulting engineer about a year ago, at the request of President Gould.

John McLeod Murphy, formerly foreman of fire-engine company No. 12 of Brooklyn, has been experimenting with a third-rail system of electric propulsion at Manhattan Beach, and expects within two weeks to have the old Marine railway fitted up with his system. His idea is to provide a means for distributing the current without the aid of exposed overhead or underground conductors. Mr. Murphy's invention is said to consist principally of his automatic switch. Each of the sectional rails is one-half the length of the ordinary trolley car, and so spaced that the car is collecting current from one section before it leaves the preceding one, the current thus being continuous as the car proceeds. There seems to be no great novelty in this, but it is announced that a public test will be given some time next month on the old Marine railway.

The committee which is engaged in the reorganization of the Kings County elevated railroad has sent a notice to the holders of the first mortgage bonds, asking them to place their holdings under the committee's control on or before February 10th. This step is believed to foreshadow negotiations for the absorption of the Kings County road by the Brooklyn Rapid Transit company, and the ultimate consolidation of all the transportation systems, surface and elevated, in Brooklyn. It is rumored further that the intention is to absorb the Long Island railroad and operate it in connection with the Brooklyn Rapid Transit system. This would give the Flower syndicate control of all the railroad and street-car systems of Long Island. The total capitalization of all the companies, is more than \$200,000,000.

The General Electric company having complained to the United States Circuit Court that the injunction formerly obtained against the Nassau Electric Railroad company of Brooklyn, for infringing the Sprague patent (No. 324,892) for the suspension of electric-railway motors, had not been obeyed, Judge Lacombe has ordered that the Nassau company be fined \$25 for each offending car. Of the trucks at present in use the judge says: "It may be that defendant's present device, in which wooden blocks, with a core large enough to allow play of the bolt which passes through them, are deleterious when the parts become loose, but, nevertheless, they do under such conditions give substantially the same freedom of movement to the nose end of the motor as was given by the 'flexible connections' of the Sprague patent. The numerous affidavits which assert that no good mechanic would allow the parts to become loose, that all loose nuts are at once tightened up, and most positive directions given to have all connections

rigid, are of little weight in contradiction of the express statement of car examined in which freedom of movement of the nose end of the motor was found to exist, the distinguishing number of such cars being given. It would seem as if, in view of character of the invention which is to be patented of the rolling stock of a road in a large city where the carrying capacity must frequently be used to its limit for days at a time, the present device does not menace infringement that it should be enjoined unless it be so modified as to insure rigidity even when in constant use." M. S.

Detroit, Mich.

DETROIT, January 28.—Within the next six months it is expected that the projected Lansing, Dexter and Ann Arbor electric road will be completed and in running order. W. W. Churchill of New York and C. W. Register and O. A. Stranahan, engineer for the Westinghouse interests, have gone over the line of the proposed road to obtain an idea of the probable cost.

Dr. R. J. Shank and C. A. Mapes of Lansing, Morris Topping of Plainville, L. C. Chase of Danville and Thomas Burkett of Dexter held a meeting in Detroit a few days ago and conferred with Wallace Franklin, the Michigan representative of the Westinghouse people in Detroit. Through the aid of the long-distance telephone figures were bartered back and forth between Detroit, Chicago and New York, and it is now definitely announced that arrangements have been completed to build and equip the road. It is expected that bonds amounting to \$1,300,000 will be issued and the capital stock of the company will be placed at \$250,000. When the road is built the Westinghouse company will also float bonds to the extent of \$1,175,000.

The projected road is to run from Ann Arbor through Dexter and Mason and a number of connecting towns to Lansing, and is to connect with the present Detroit, Ann Arbor and Ypsilanti road. Work will be commenced in the spring. G.

Canadian Intelligence.

OTTAWA, January 28.—For some time the town of Lindsay, Ont., has been trying to secure a cheap electric power. Culverwell and White-Fraser of Toronto undertook to form a company and transmit the power from Fenelon Falls to Lindsay, but were unable to make the financial arrangements necessary to the undertaking. The matter has now been taken up by some of the citizens of Lindsay. An electrical expert is to be employed to look into the subject, and if it is indorsed by him the plan will be carried through.

It has been decided that the city of Toronto can prosecute the street-railway company before the police magistrate for failing to comply with the by-law calling for vestibules on motors and trailers for the protection of conductors in winter months. The courts have given the city a victory in this litigation, holding that the company could be proceeded against, by summary conviction before the magistrate. The company has unsuccessfully contended that it can be punished by indictment only.

Mr. Wallberg of Montreal has been in Ottawa negotiating with the Canada Atlantic Railway company to have the new shops of the company, which they are about to erect at Ottawa, fitted up in a modern manner and similar to the shops recently completed at Sherbrooke, Quebec. There the power is supplied by electric motors. The Buffalo Forge company's system of fans has been adopted for heating purposes.

The Metropolitan Electric Light company of Ottawa is now an incorporated body. The canal for the development of the water power to be utilized will be 180 feet wide, nine feet deep and 2,000 feet long. The reservoir will extend up the lake for a distance of 30 miles and will be 1 1/2 to three miles wide and 40 feet from shore. The power house will be erected at the foot of the Deschene Rapids.

At Prescott, Ont., the by-law to raise \$75,000 for municipal electric-light plant was carried by 37 majority.

The Toronto Elevated Railway company asks incorporation, with power to construct a system of elevated railways in adjoining municipalities.

Writs of summons against the corporation of the city of London, Ont., have been prepared at the instance of the London Street Railway company, in a suit of damages arising out of the recent strike of the company's employees. The amount claimed is \$20,000, and the wording of the claim is for "inciting riots, causing damage to the plaintiffs, and for neglect of duty and for breach of duty." The meeting of the City Council at which the street-railway company was denounced on all sides and the prospective strikers upheld is what the suit for damages is especially aimed at.

It is not generally known that Canadians are putting in something like \$1,000,000 into Jamaica, in the shape of an electric street railway. The company is formed of Montreal and Halifax, N. S., capitalists. Hon. Dr. Johnston, a member of the Jamaica Legislative Council, who is visiting here, introduced a bill into the Jamaica Council, and obtained for the company the necessary license to enable it to install the plant in Kingston in 1897. An amendment to this bill has now been found necessary, as various complications have arisen by reason of the change of power from steam to elec-

tricity. A waterfall, about 20 miles from the city of Kingston, will supply the electric power needed.

The Toronto electric street-railway gross receipts for 1898 were \$108,924, as compared with \$99,336 for the year previous.

The annual meeting of the shareholders of the London (Ont.) electric street railway was held recently. Notwithstanding the loss entailed by the recent and prolonged strike of the railway's employes, the gross earnings showed an increase of over \$12,000 for the last year. The number of passengers carried in the year was nearly 3,000,000. The gross earnings per capita of the population were \$2.95.

A by-law has been passed by the council of the city of Hull, Que., providing for a loan to purchase dynamo and give the city its own plant for electric lighting, operated by its own water power, which cost the corporation \$23,000. The lighting committee is now asking for tenders for poles, wires, lamps and dynamo.

The first car on a Canadian steam railway illuminated by electricity is now running between Montreal and Toronto.

The directors of the Montreal electric street railway have just decided on a new departure. After much consideration, the board has decided to concentrate the whole of its business at the Hochelaga workshops. The company intends in the spring to build a large brass foundry for the manufacture of its brasses, and a large iron foundry for the iron-work required for the cars, an important part of this being the car wheels. The new buildings required for this great work of centralization and expansion will involve an expenditure of upwards of \$500,000.

In the appeal of the London, Ont., street railway from an assessment of its cars by the city, the Court of Appeal for the province has declared the cars to be personally and not realty, which means they are non-assessable.

The town of Dartmouth, Nova Scotia, is asking power of the provincial Legislature to issue \$150,000 of bonds for the purpose of operating an electric street railway in that town and vicinity. A bill will also be submitted empowering the issuing of bonds to the amount of \$50,000 to establish an electric-light plant for lighting the streets and public buildings.

The Lake Megantic Pulp company of Lake Megantic, Que., will ask the government of that province for an increase of its powers, with a view to supplying electric light and power and constructing tramways.

The Hull and Aylmer Electric Railway company has purchased from the Canadian Pacific railway the line from Hull, Que., to Aylmer, Ont., over which the former company's cars now run. Since the beginning of its service the Hull-Aylmer Electric company has been using the tracks under lease, but a deal has now been completed whereby it becomes possessor of the line for \$100,000.

Mr. E. Hanson of Hanson Bros., bankers and brokers, Montreal, has just returned from New York, where he has been closing the deal for the Havana street railway. He says that they have now actual possession of the Havana street railway, which his company has been operating since January 1st. The cars will, for a time, continue to be drawn by mules, but in a short time electricity will be used.

A. V. W.

Northwestern Notations.

MINNEAPOLIS, January 28.—A council committee at Winona, Minn., will soon report on the cost and advisability of a municipal electric-light plant.

The Badger Electric Light company of Racine, Wis., has paid \$521.71 to the city treasurer, being 1½ per cent. tax on its gross earnings.

A Mr. Lyon, living near Livingston, Mont., has a new theory of the way to produce rainstorms at will. He thinks electricity the secret, and argues that by producing a positive current, well up in the air, and a negative current, also well elevated, the result will be that clouds will form and the rains descend. He proposes to have one positive circuit and four negative, all elevated by means of balloons, and when it is desired to stop the rain he would reverse the currents and put out four positive and one negative. He would have an immense power plant to cover with wires a territory 60 miles square, which should furnish rain for that amount of ground. He is regarded as a crank on the subject, but is said to be thoroughly in earnest as to the feasibility of his scheme.

The Street Railway and Electric Lighting company of Burlington, Ia., is considering the extension of its line to West Burlington this season.

The Des Moines Edison Electric Light company of Des Moines, Ia., will expend \$300,000 in improvement and extension to its system.

The matter of electric light will probably be voted on by Madeline, Minn., in the spring election.

The gas committee of the City Council in Minneapolis is considering the substitution of Welsbach gas burners for arc light in the business portion of the city on account of the high price of arc light.

The Burlington Railway company of Racine, Wis., made its 1897 earnings in 1897 by \$13,000.

The directors of the Burlington Railway company, presented before Appleton, Wis., to carry passengers and freight.

E. Desmar, manager of the Citizen's Traction company of Oshkosh, Wis., was elected vice-president of the company at the recent annual meeting.

The Supreme Court of Minnesota has cut down the verdict awarded S. D. Peterson against the Western Union Telegraph company from \$20,000 to \$1,000. Peterson must either accept that amount or take the chances on a new trial. The case has been in the courts for a number of years and grew out of a telegram sent Peterson at the end of a senatorial contest six years ago, in which Peterson bolted the party nominee. The message read "Slippery Sam, your name is pants," and was signed "Many Republicans."

The Citizens' Heat, Light and Power company is an applicant for a franchise at Waterloo, Ia., and the application will be voted on at the March election.

The council of Cloquet, Minn., has laid on the table for three months the application of F. McCormack of Duluth for an electric-light franchise. The Northwest Paper company is installing a large plant there and expects to be able to furnish electric lighting from its plant cheaper than any steam-power plant can afford to do. Hence a suggestion was made to wait till spring, when the company would put in a proposition.

F. McCormack has been granted a franchise for an electric-light plant at Pine City, Minn.

The people of Valley Junction, Ia., are figuring on securing electric light by the Des Moines Edison Electric Light company extending its system from Des Moines to that village.

The Assembly of St. Paul demands that the street-railway company give five-minute service on the Grand avenue line during the busy hours of the day.

Representatives from several telephone and electric companies have been in Minneapolis recently, studying the new problems in electrical development which have been presented by the operation of the new power dam in the Mississippi River. When the dam was first put in operation the telephone system was seriously affected. The introduction of full-metallic circuits by the telephone company and of reduction coils in the plant by the street-railway company have reduced, though not entirely done away with, the trouble.

The new electric-light plant at Watertown, S. D., has been completed and put in operation.

Telegraph poles along the right-of-way of the Chicago, Milwaukee and St. Paul railway near Marinette, Wis., were recently set on fire. The guilty person is found to be Chris Larson, who seems to have a mania for that sort of amusement. He served a year in the state prison for a similar offense once before, and has been out only since Christmas. P.

New England News.

Boston, January 30.—If an order adapted at a meeting of the Boston aldermen comes to fruition in the shape of legislative enactment, this city will enter upon the municipal ownership of transportation service before many months. The order referred to requests the mayor to petition the Legislature for the passage of an act authorizing this city to establish a system of electric-car service through, or on the outskirts of, the municipal park system.

The multiple uses to which electricity has been put in the new south terminal-railway station excite the wonder and admiration, not only of the general public, but of visiting electricians and engineers, who find the plant and its appurtenances among the most comprehensive and complete ever devised. The generating plant is located in a building 460 by 40 feet in dimensions. Here are 10 large boilers, two economizers, compound engines of 1,500 horse power capacity, four Westinghouse multipolar dynamos, refrigerating and heating apparatus and other necessary appointments planned to meet the requirements of the largest railroad station in the world. Steam, electricity, compressed air and heat are distributed from this point to various parts of the structure. The signals are worked by electricity, so are the 19 elevators, and an electro-pneumatic interlocking system is used for the changing of the switches. Electric motors for pumping apparatus and ventilating fans are also a feature of the outfit.

At the annual meeting of the Boston Elevated Railway company Horatio N. Slater and William S. Spaulding, two of the largest stockholders, were added to the board of directors. William Endicott, Jr., formerly on the board, steps out. The annual report shows gross earnings from operations for the last year to have been \$9,179,096. The operating expenses were \$6,566,584. The net earnings from leased lines were \$2,612,512. Total payments under lease of the West End street railway, including subway rental, interest, dividends and taxes, were \$2,197,724. The surplus for the year is \$214,077. From the report it is learned that the total number of revenue passengers carried during the year was 181,321,295, an increase of 8,766,782. In relation to the elevated railway which the company is getting under way, to be operated by electricity, the report says: "Within a short time we expect to have under contract a large proportion of the structure upon the route upon which we have been authorized to build by the Boston city government. Much thereof will be completed by next fall. The plans for the terminal stations at Roxbury and Charlestown have been completed, and a large part of the land required for the same has been taken by eminent domain or purchased. In another year we believe we will be able to report great progress in our construction operations."

A measure that has attracted the attention of capitalists throughout the state who are interested in electric-light plants was brought before the Legislature last week in a bill whose purpose is to make it easier for municipalities to acquire such plants by purchase. The act of 1891, now in force, provides that in purchasing established plants "the price to be paid therefor shall be a fair market value for the purposes of its use." This has been construed to include as a factor the plant's earning power, but the amendment sought provides that the price to be paid shall not exceed the "reasonable cost of buying and establishing a plant, or like portions of a plant, of equivalent capacity of production and distribution, and as serviceable quality of material and construction, counting at its fair market value the land purchased." And this is obviously a very different proposition. The fate of the bill is in doubt.

At Augusta, Me., before the Maine legislative committee on railroads, attorneys for the Boston and Maine appeared last week to oppose a general act brought up in that body, authorizing electric roads to increase their capital stock to effect leases.

The days of the stage-coach in the White Mountains in New Hampshire will soon be numbered.

An electric road is projected to connect Meredith and Ossipee, running through Center Harbor, Sandwich, Moultonboro and Tiltonboro, and traversing about 20 miles of country adjacent to Lake Winnepesaukee, now without railroad facilities, and reached mainly by the old-style coaches. B.

PERSONAL.

H. T. Paiste of Philadelphia was in Chicago last week.

Russell Stanhope, president of the St. Louis Electrical Supply company, paid a visit to Chicago a few days ago.

President Henry Lescher of the Lescher-Macomber-Whyte company came up to Chicago last week and visited his prospering Chicago branch on South Canal street.

William A. Clark, the newly elected senator from Montana, is said to be the largest individual owner of copper mines and smelters in the world. He is 60 years old and a native of Connelleville, Pa.

General Manager H. K. Gilman of the Western Electrical Supply company of St. Louis was in Chicago for a few days this week. Mr. Gilman reports improved business throughout the Southwest, and all the signs of the times point to a splendid business during the next year or two.

General Sales Agent Frank S. De Ronde of the Standard Paint company of New York appeared in Chicago last week and was warmly welcomed by his many old friends in the electrical business. Captain De Ronde has only recently recovered from a very serious attack of typhoid fever, which was contracted during the late war, while in camp with the Second Regiment, New Jersey Volunteer Infantry.

One of the hardest workers during the Northwestern electrical convention was Miss Katherine Cantillon, the young lady stenographer at the Pfister. Her services were invaluable to those who had hurried work. For over a year and a half Miss Cantillon has held this position at the Pfister and has won a reputation for rapid yet painstaking stenographic work, and has made many friends among the traveling public.

Mr. Bion J. Arnold, the Chicago electrical engineer, who made a personal exhibit at Omaha of his work as an engineer and mechanic, has been honored by the receipt of the diploma and gold medal of the Trans-Mississippi and International Exposition for the excellence of his engineering designs. The diploma and medal are both fine specimens of workmanship, and Mr. Arnold has a right to be proud of them.

Washington G. Benedict, a wealthy citizen of Boston, who established the first electric road operated in Massachusetts, and has ever since been largely interested in electric railways and electric appliances, died on January 24th, aged 62 years. Mr. Benedict was born in Pawtucket, R. I., February 22, 1836, and received the name Washington in honor of the day. His early life was spent in the West, where his father had a packing business. In 1876 Mr. Benedict went to Florida and established the town of Orange Park, now one of the flourishing fruit centers of that state. He came to Boston in 1881, and commenced his railroad career. He was first president of the electric road between Winthrop Junction and the Point of Pines; he helped to build up the beach at Revere, owned hotels, real estate and other property, and was widely known for his genuine charity.

ELECTRIC LIGHTING.

H. V. Gates of Hillsboro has contracted to put in a gravity water system and an electric-light plant in Elgin, Ore.

An engineer has been instructed to prepare working plans and specifications for the proposed system of public electric lighting for Palo Alto, Cal.

The Newport (Herkimer County, N. Y.) Electric Light and Power company was incorporated last

week, with a capital stock of \$15,000. William D. Grant of Newport, N. Y., is one of the directors.

The lease of the electric-light plant of Centralia, Wash., expired on February 1st. The city desires bids from competent persons for the lease of the plant for one year. The city clerk will give particulars.

The Elmwood (N. Y.) Light and Power company has been incorporated. The capital stock is \$100,000, and the directors are Robert C. Pruyn of Albany, W. L. Elkins of Philadelphia and John Dunfee, W. B. Kirk and P. J. Mack of Syracuse.

Bids for installing electric-light plants in the Springfield avenue and Central Park avenue pumping stations of Chicago were opened last week by Deputy Commissioner of Public Works Toolen, the bids being as follows:

	Springfield Avenue Station.	Central Park Avenue.
Arthur Frantzen & Co.	\$3,085	\$3,000
Henry Newgard	2,410	2,200
Western Electric company	2,381	2,218
Roonheld & Gallery	2,198	2,388

ELECTRIC RAILWAYS.

An electric road will be built from Lawton to Paw Paw, Mich., next summer.

It is said that the new electric road between Kalamazoo and Allegan, Mich., is now an assured fact, capital having been secured.

Preparations are making in Battle Creek, Mich., to build a road from that city to Allegan, owing to rumors that the Detroit, Toledo and Milwaukee Railway company intends to tear up its tracks and relay them to Grand Rapids, via Gull Lake.

According to a Los Angeles newspaper, the Terminal Railway company has appropriated \$350,000 for electrical development the coming year, and it is probable that \$500,000 will be spent before long in running the trolley to Alhambra and Sierra Madre, as well as to Pasadena.

Fifteen miles of street-railway track were opened in Zurich, Switzerland, last week for electrical operation, which has replaced animal power. Both cars and power-house machinery are of American construction, and American engineers assisted the city engineers in the installation of the plant.

It is stated that Henry Bucey and his associates in Tacoma and Seattle are preparing to ask the councils of the two cities for a franchise for an air-line electric railroad to connect them. The proposed railroad will be standard-gauge, 31 miles long, and built along the bluff from one to several miles back from the Puget Sound shore.

Consul Erdman writes from Breslau, under date of January 9th: "I wish to inform our manufacturers of and dealers in street-car rails, electric motors, wire and electric supplies that the street-car company of this city, which has been using horse power, has been granted the privilege by the city authorities to employ electric motive power at the expiration of its present charter, which will be in 1902."

A movement has been on foot for some time to reduce the fare on the street railways in Washington, D. C., and the first step has been taken by the introduction of a bill by Senator Carter, providing that over all lines of the Capital Traction company and those of all other street railroads operating in the city, the fare within the hours of 6 and 9 a. m. and 4 and 7 p. m. shall be but three cents; during all other hours of the day the rates are to remain as they are at present. A failure to comply with the provision would be the cause of a penalty of \$10 for each offense. The bill also provides that the gross annual receipts of the Capital and Metropolitan companies shall be taxed one per cent., payable quarterly, the proceeds to be used by the commissioners of the district toward the maintenance of the Washington Public Library.

The Union Traction company, which has eight miles of road in operation between North Arlington, N. J., and Carlstadt, has been sold by William M. Johnson, receiver, and was bought in by William C. Giles, of the reorganization committee, representing 90 per cent. of the stockholders. The bid was \$20,000 more than the indebtedness, which is \$852,000. Mr. Giles stated that it was the purpose of the company to carry out the original plan of extending its tracks to Hackensack as soon as possible. The Bergen Traction company expects to have cars running on its new line from Fort Lee to Bogota, across the river from Hackensack, before March 1st, and it will bridge the river in the spring near the Main street station of the Susquehanna railroad. It is understood that the two companies will be rivals for right-of-way through the town. Refusal to grant a franchise to the Union Traction company through Hackensack forced it into the hands of a receiver more than a year ago.

PUBLICATIONS.

The Ridgway (Pa.) Dynamo and Engine company is distributing a well-arranged bulletin giving data of its products—the Thompson-Ryan dynamo and the McEwen engine. Great improvements have been made, it is said, in the details of the ma-

chines. The advantages claimed for the dynamo are these: "Higher efficiency; fixed brushes with no sparking; light weight; cooler running of armature, commutator and fields; all necessary compounding furnished by the 'balancing coils'; ability to vary the compounding 15 to 20 per cent. by simply loosening clamps and changing the position of the brushes, and this without any effect whatever upon the commutation; very small field coils, thus eliminating the danger from inductive discharge upon opening the field circuit; adaptability for charging accumulators, as machine cannot be reversed as long as direction of current in shunt field remains the same; more even distribution of load with machines in parallel."

TELEGRAPH.

The Canadian government is considering the advisability of asking the Dominion Parliament for an appropriation to build a telegraph line to Dawson, N. W. T., as a government work. At present the government telegraph system extends to Quesnelle, in the Cariboo district of British Columbia. From Quesnelle, over the old Western Union route to Telegraph Creek, and thence to Dawson, the distance is about 1,300 miles. Competent electricians have just reported to the government that it would cost \$750,000 to construct and equip the line.

The Berlin correspondent of the *Daily News* of London says: "A joint stock company has been formed at Cologne, with a capital of £500,000, to lay a cable direct from Germany to the United States. At the same time Wolff's Telegraph Agency decided to establish a branch office in New York city. Evidently the 'yellow'-press campaign against Germany, which has caused great embitterment on both sides, has induced the German government to favor this project, by which it is hoped to exercise a direct influence upon public opinion in the United States."

POWER TRANSMISSION.

The New England Electric Power company, with capital of \$500,000 and head office at Portland, Me., has been incorporated. The incorporators are P. S. Saltonstall, Milton, Mass.; E. P. Shaw, D. K. Snow, Brookline, Mass.; S. R. Anthony, N. Anthony, A. Potter, F. Y. Hall, Boston; W. G. Bencheroff, Auburndale, Mass.; E. P. Kidson, Neponset, Mass.; R. M. Saltonstall, Newton, Mass.; H. E. Boothby, Reading, Mass.; J. Drummond and J. Drummond, Jr., Portland.

A note from San Francisco is to the effect that the Equitable Gaslight company of that city has been incorporated with a capital stock of \$1,500,000. The directors are W. J. Dungee, C. L. Ackerman, W. J. Henshaw and others. In addition to the gas-plant, an electric plant is to be constructed for the generation of electric power for the street railroads, supplying electrical companies with power, and for distribution to such manufacturing establishments as may desire it. The plants will be under the direction of Dr. Chisholm.

The Seattle, Wash., *Past-Intelligencer* says that the Seattle Power company, organized with a capital of \$1,250,000, will install a plant capable of furnishing 12,000 horse power at the falls of Cedar River. The scheme to harness the waters of the Cedar River, to utilize the power for manufacturing purposes in Seattle, through the medium of electricity, will soon be realized. For the present but 12,000 horse power will be generated, but it is understood that later the capacity will be more than doubled. E. H. Amidon is president of the Seattle Power company.

ELECTRICAL SECURITIES.

The North Shore Traction company reports gross earnings for December of \$113,852, an increase of \$5,080 as compared with the same month of the previous year, and net \$45,602, an increase of \$1,603. For the three months ended December 31st the gross earnings were \$341,386, an increase of \$4,848 as compared with the corresponding period of the previous year, and net \$129,655, a decrease of \$102.8.

The New Orleans Traction company reports gross earnings for December of \$113,361, an increase of \$3,425 as compared with the same month of the previous year, and net \$48,480, an increase of \$3,071. For the year ended December 31st the gross earnings were \$1,316,791, an increase of \$79,528 as compared with the corresponding period of the previous year, and net \$512,461, an increase of \$112,581.

The general advancement of securities has brought the stocks of many corporations prominently forward, when, under ordinary conditions, very little trading would be done in them. Among this class is Western Union, which has been made one of the leaders of the market. In view of the enormous business that the telegraph systems of the country have transacted during the last six or eight months, first in connection with the war and now in consequence of unusual activity in business and speculation, it is surprising that Western Union stock should have remained dormant as long as it did.

The directors of the Chicago City Railway company have decided to issue \$1,000,000 of the \$2,000,000 additional stock authorized at the annual meeting, although the shares will not be actually put out

until about July 1st. Resolution adopted by the board explain that the stock had been offered to stockholders of record on June 15th at 110, but the money in payment will be received on and after February 1st, and interest at four per cent a year allowed until the stock is delivered. This is in accordance with the usual custom of the company in issuing new stock. The proceeds will be used for extension and new line.

TRADE NEWS.

A handsome lithographed card calendar is issued by the Joseph Dixon Crucible company, of Jersey City, N. J. Its features are an attractive picture in colors, the calendars for 1899, 1900 and 1901, and a few lines about the Dixon pencils and crayons.

The Chicago Edison company has recently secured the contract for installing a complete electric-light plant in the new Massachusetts building, at the corner of Fayette and Charles streets, in Baltimore, which is to be a modern fireproof office building. The building is to be wired for 1,500 16 candle power lamps in iron conduit.

The electrical trade in general, and particularly in the West and South, will be interested to know that President W. N. Matthews of the St. Louis Electrical Supply company of St. Louis, Mo., has sold out his interest in that company. The company will be carried on, as heretofore, with Russell Stanhope as president and George S. McLaren as vice-president.

The National Automatic Telephone company, 71-75 West Jackson boulevard, Chicago, sole manufacturer of Lundquist's automatic telephones and switches, is putting in a system in Wilson, Kan., of which W. D. Jellison is proprietor. A new telephone exchange is also being installed at Kinsley, Kan., using the National automatic system. Great Bend, Kan., is also putting in the National company's instruments.

The Western Electrical Supply company has quite a number of men on the road making aggressive efforts to secure its share of the business of the West and Southwest. The company is making a special drive on the Warren alternators and is also meeting with success in placing Moloney transformers; in fact, the ability of the company to furnish, not only Warren generators, but alternating-current motors as well, to say nothing of such a fine line of transformers, puts it in a position to bid successfully on heavy-machinery contracts.

Philip Cass has withdrawn from the Cass & Aaron company of Chicago and has interested himself in the firm of Cass & Co., doing business at 54-60 South Canal street, Chicago. He is prepared to fill orders for dynamos, motors, arc lamps, transformers and supplies of every description on short notice and at the lowest prices. The new firm has a large stock of second-hand apparatus and a well-fitted repair shop. It makes a specialty of rewinding transformers at figures which will equal about one-half the cost of new transformers.

The Berlin Iron Bridge company, at East Berlin, Conn., has just shipped several carloads of bridge material to the Hawaiian Islands. It is believed this is the first American bridge to be put up in the islands. The contract for this bridge was obtained through the company's agency at Honolulu, and men will be sent from the United States to put up the bridge, which is for highway travel. It consists of one span of 200 feet, 40 feet wide, and will be located across a river in one of the larger towns of the islands. The Berlin Iron Bridge company is doing quite a large foreign business, having a regular agency established at Honolulu, also one at Guadalajara, Mexico, and another at Berlin, Germany. It also has a representative at the present time traveling through Russia obtaining information in reference to the possibilities of steel buildings for that country.

When a man comes all the way from Warren, O., to attend a Northwestern electrical convention it is a high compliment to the usefulness of the association, and should go on record as such. Elmer W. Gillmer of the Warren Electric and Specialty company arrived at the Hotel Pfister the last day of the Milwaukee convention, just in time to put the finishing touches on the exposition of his new fan motor. This new specialty, which has recently been brought out by the Warren Electric and Specialty company, was the main feature of the exhibit made by the Illinois Electric company. The great claim made for the new fan motor is that it possesses a much greater efficiency than any fan motor now on the market. Mr. Gillmer states that he is prepared to demonstrate this by actual tests, and the knowledge that this is the case will undoubtedly bring large sales. The factory in Warren has been equipped to turn out these machines in large quantities to meet the spring demand.

At the annual meeting of the stockholders of the Warren-Medbery company at Sanly Hill, N. Y., H. E. Tidmarsh, George W. Wait, W. W. Wells, W. H. Cunningham, C. W. Kellogg, H. B. Warren and S. C. Medbery were elected directors. Officers were named as follows: President, H. E. Tidmarsh; vice-president, H. B. Warren; secretary and treasurer, George W. Wait. The officers report a gratifying amount of business done under satisfactory conditions and an encouraging outlook for the year

ing year. In the first year of its existence the company has become well known in the electrical trade. Its sales agencies throughout the entire country are well organized and the inquiries for Warren-Medbery generators are constantly on the increase. The officers and shareholders of the company considered the prospects of the company so encouraging that they have determined to increase their capital stock for the purpose of obtaining increased shop facilities for the manufacture of their apparatus.

BUSINESS.

Bernard Hartley, manager of the Hartley Electrical Works, 263 Randolph street, Chicago, states that the firm has all it can do to take care of the volume of repair work which it is receiving. The careful, painstaking, personal attention which Mr. Hartley gives to all work with which the company is favored accounts for its constantly increasing business.

The Buckeye special coiled filament, for use on alternating systems, and which is used in the Buckeye incandescent lamp, is of the cellulose type, and manufactured exclusively by the Buckeye Electric company of Cleveland, O. Maintained candle power and long life are the two points of merit claimed. The Buckeye Electric company carries a large stock of lamps at 753 Monadnock building for the accommodation of the western trade.

The Electric Appliance company is calling attention to the accessibility of its new location at 92 and 94 West Van Buren street. There is probably not another corner in Chicago that has more transportation lines passing it than the corner of Van Buren and Jefferson streets. Several electrical surface lines pass the building, in addition to cable and

elevated railways. None of the Electric Appliance company's friends when in Chicago should fail to visit it in the new location.

The Chicago Fuse Wire and Manufacturing company, 154 Lake street, Chicago, and 853 Broadway, New York, is offering something interesting in the way of railway fuse links. There seems to be no question as to the quality of goods made by this company.

Owing to increased business demands made upon Baker & Co., the platinum refiners, they have found it necessary to remove their New York office from No. 121 to No. 120 Liberty street, to secure additional space. They have on exhibition at the latter address a number of specimens of crude platinum, among which is their large nugget, which is believed to be the largest nugget in any collection on the American continent. The collection is very interesting to metallurgists, chemists and all persons interested in the different uses of platinum.

J. Holt Gates & Co., Marquette building, Chicago, in addition to orders from Armour & Co., Union Stockyards, Chicago, for one 800-kilowatt and two 500-kilowatt Walker power generators and one 7,000-light and two 3,600-light Warren inductor alternators, report the following sales: One 75-kilowatt Warren alternator to the Marion (Ill.) Electric Light company; one 50-kilowatt Wagner multipolar dynamo to the Jefferson Electric company, Chicago; one 200-kilowatt, 220-volt Card generator to the Davenport (Ia.) Gas company, and one 150-light, 2,000 candle power Excelsior arc machine to the Burlington (Ia.) Street Railway company.

The Western Electric company of Chicago and New York is furnishing its customers Simplex friction tape packed in tin boxes. The boxes are 4/4

inches in diameter and one inch deep, and contain one-half-pound rolls of tape carefully wrapped in oil paper. The tape is prepared from high-grade materials, and is furnished in either white or black. This method of packing tape has advantages which are readily appreciated. The tape is thoroughly protected from the drying-out effect due to the exposure to air, and is also protected from dirt. The box is of a convenient size to be carried by the wireman, and will supply him with a receptacle for the partially used roll which otherwise might be thrown loosely into the tool-bag. It is convenient, always clean and economical, and contractors, central-station managers and users of tape generally are asked to consider the advantages of the new method.

In the line of annunciators many promising improvements have been made during the last few years in the way of guest-call and fire-alarm attachments, which are universally used throughout the country in all the larger and more modern hotels; but a still greater step in advance is the employment of the telephone system, which is now being used in a great many hotels in connection with the annunciators. The telephone enables the clerk to call the occupant of the room, and by connecting a plug in the spring-jack, directly beneath the return-call push, he is enabled to carry on a conversation by means of the telephone, which does away entirely with the old system of speaking tubes, which was formerly used in a great many instances. The Western Electrical Supply company of St. Louis, Mo., has recently incorporated this system into its well-known Perfection Annunciator, and is now in a position to furnish any hotel instrument, with or without return-call attachment, with the telephone attachment, full particulars of which will be furnished on application.

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued January 24, 1899.

- 618,054. Train Traction System. Frank E. Case, Schenectady, N. Y. Application filed June 22, 1898.

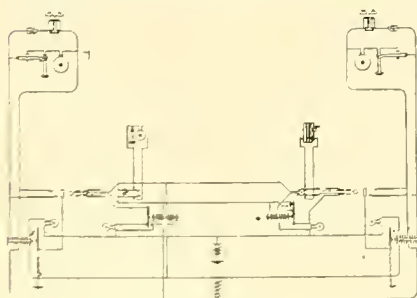
This system of train control for electrically propelled vehicles includes a cable extending through the train, having connection boards at intervals, with a controlling device adapted to register with any one of the connection boards.

- 618,057. Secondary Battery and Electric Lamp. Walter A. Crowds, Chicago, Ill. Application filed November 22, 1897.

A cylindrical lead-containing cell has its inner surface provided or coated with an active material forming one element, and a laterally perforated centrally located tubular opposing element of the battery open at the top and closed at the bottom forms a central well for the purpose of supplying liquid to the battery.

- 618,071. Motor Speed Controller. Charles A. Dresser, Chicago, Ill. Application filed July 28, 1898.

There is described the combination with a solenoid and the core thereof of a variable rheostat having the movable element thereof connected with the core, a switch for energizing the solenoid to move the core thereof, a lock for holding the core in any position to which the same is moved, a releasing magnet for releasing the lock and a switch for controlling the circuit through the releasing magnet.



NO. 618,137.

- 618,131. Bearing for Armature Shafts of Electric Motors. Herbert L. Parker and Charles R. Weston, St. Louis, Mo. Application filed July 9, 1898.

A suitable frame supports an annular laminated field magnet core. A shaft is fixed in the frame, a sleeve is mounted on the shaft and a laminated armature core is mounted on the sleeve.

- 618,137. Signal for Telephone Switchboards. Charles E. Scribner, Chicago, Ill. Application filed December 8, 1896.

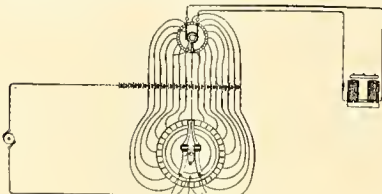
The combination with a telephone line and means for producing current in the line while the telephone is in use of a relay magnet in the line, a local circuit including a supervisory signal, a normally open shunt about the signal controlled by the contact points of the relay, and a magnet winding of the relay included in the shunt.

- 618,144. Electrical Selective Apparatus. John S. Thompson, Chicago, Ill. Application filed October 10, 1898.

The arrangement includes a series of electrical devices, which are constructed so as to be actuated by successively smaller currents and also so as to require successively greater periods of time for actuation, and which are arranged and connected so as to cause their action to be controlled entirely by their respective characteristics, and means whereby, upon the actuation of any one of the devices, the relatively slower ones are in effect rendered inoperative.

- 618,162. Magnetic Closer for Electric Railways. William M. Brown, Johnstown, Pa. Application filed August 27, 1898.

A magnetic closer comprises the combination of a plurality of cores and energizing-coils for the same, a single continuous metallic pole piece provided with perforations and coated throughout with enamel connecting the cores, a series of disconnected metallic plates, and belts passing through the perforations and securing the plates against the under side of the coated pole-piece.



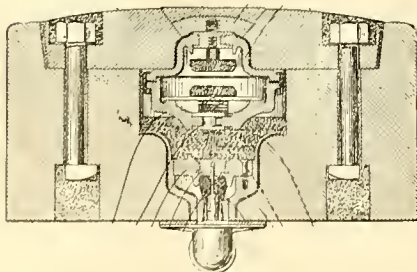
NO. 618,175.

- 618,163. Electric-motor Control. William M. Brown, Johnstown, Pa. Application filed October 7, 1898.

The method of accelerating two electric motors having a plurality of field windings consists in effecting small differences in acceleration by changing the field circuit of one motor without altering that of the other, larger differences by changing the field circuits of both motors and still larger differences by changing the circuit relations between the two motors.

- 618,175. Automatic Switch for Distribution of Electricity. John Hopkinson, London, England. Application filed April 18, 1895.

An automatic switch is provided with a range of contacts connecting with the several cells of a battery, a brush for cutting in or out the several cells, a motor for controlling the switch, an electromagnet for releasing the motor and an auxiliary switch in fixed relation and movable with the main switch connecting part of the battery with the magnet.



NO. 618,179.

- 618,179. Circuit Closer for Electric Railways. George H. McFeaters, Johnstown, Pa. Application filed October 10, 1898.

An electric contact box consists of a cover forming the contact portion of the box, a closed vessel below the same, a fixed electrode within the same and electrically connected to the cover, a movable electrode below the fixed electrode, an armature carrying the movable electrode, ledges formed in the vessel and normally supporting the armature, a continuous flexible ribbon connected to the armature, and a conductor in the bottom of the vessel in connection with the source of electrical supply and with the ribbon.

- 618,231. Trolley Stand. Daniel Moyer, Allentown, Pa. Application filed April 12, 1898.

A pivoted pole-socket is provided with a lever; a pivoted arm is mounted to oscillate independently of the

lever; a device is carried by the lever to engage the arm when the lever is moved in one direction, and tension means for retaining the arm in one position.

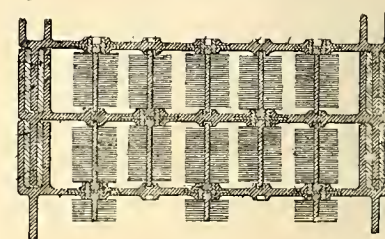
- 618,247. Secondary Battery. Henri Dolter, Lyons, France. Application filed April 23, 1898.

The flanged walls of non-conductive material are adapted to be put together to form closed chambers, metallic nipples traversing the walls and fixed therein, positive electrodes having stems attached to the nipples on one side of each wall, negative electrodes having stems attached to the same nipples on the other side of each wall, the electrodes lying in the spaces between the electrodes of the contrary sign of the adjacent walls respectively, and their stems having loose bearing at their unattached ends in recesses in the adjacent walls, two end walls having respectively positive and negative electrodes on one side only and terminals in electrical connection with the nipples of the end walls respectively.

- 618,328. Electrical Signal System. John P. Buchanan, Boston, Mass. Application filed June 10, 1893.

The combination of a track circuit including a polarized translating device, a neutral translating device and a current reverser, a signal controlled by the circuit, means for operating the current reverser, and another circuit controlling another signal and operated by the circuit including the translating devices.

- 618,380. Electric Switch. William J. Ferguson, Baltimore, Md. Application filed February 2, 1898.



NO. 618,247.

An electric switch is described having in combination a case with a stationary circular chamber, the terminals of an electric circuit exposed in the chamber, a segment-shaped non-conducting plate in the chamber pivoted so as to turn therein like a rotary key, and mercury in the stationary chamber which shall be shifted by turning the segment-shaped plate.

- 618,384. Automatic Weighing Machine. Francis H. Richards, Hartford, Conn. Application filed December 11, 1897.

One feature is an electric controlling circuit, an electric power circuit, an electromotor for rotating the valve actuator, brake-controlling means governed by the controlling circuit, an automatic circuit controller operative simultaneously with the brake and governing the power circuit, and automatic circuit-controlling means for the controlling circuit.

REISSUE.

- 11,710. Electrical Hammering Machine. Thomas C. Robinson, Boston, Mass. Application filed November 22, 1897. Original No. 566,537, dated August 25, 1896.

A portable tack-driving machine comprising a casing or holder having a tack-delivering throat, means supported by the casing for delivering tacks to the throat, a driver movable in the throat, suitable means for moving the driver in one direction, an electric motor for moving the driver in the opposite direction, and means under control of the operator for causing the motor to give a single stroke to the driver and then stop.

Western Electrician

EVERY SATURDAY.

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No. 6

Reunion by Telephone.

At the very successful dinner of the Northwestern association of the alumni of the Massachusetts Institute of Technology, held in Chicago on the night of February 3d, a noteworthy use was made of the long-distance telephone to put the gentlemen present in communication with similar gatherings of alumni in Boston and St. Louis and with the laboratory of Thomas A. Edison at South Orange, N. J., and an orchestra in Milwaukee. The idea originated with the officers of the Chicago association and met with such an enthusiastic reception that it grew to dimensions not anticipated when it was first suggested. The affair attracted great attention from the press of the country and proved a very enjoyable feature of the several banquets.

The long-distance conversations were made possible, of course, by the co-operation of the Ameri-

but a tally showed that nine men were doing the cheering. The arrangements at Chicago were very simple. The University Club is but a few feet from the new Central exchange of the Chicago Telephone company, and a couple of extra wires carried from window to window made the connection. A trunk line connects the Central exchange with the long-distance exchange at Kedzie and Forty-seventh streets, and from that point the long-distance lines diverge from the city. In the banquet room there were about 60 receivers distributed on the tables, not enough to go around, but enough to give every man a chance to hear about half of the time. A portable desk set was placed at the head of the central table in front of President Ferguson, and close at hand was a stationary cabinet set, at which Mr. Andrews officiated to make the opening arrangements. The talking from Chicago was done

Massachusetts Institute of Technology alumni in Chicago to-night?

"I have been called upon to say a few words to the members of the Massachusetts Institute of Technology over a long-distance telephone, and I take great pleasure in greeting the Chicago members of the Massachusetts Institute of Technology alumni in Chicago to-night. It is due, in a great measure, to the efforts put forth in the telephone field of research by the graduates of the Massachusetts Institute of Technology that I am able to talk with the alumni members in Chicago to-night. I have in my employment a large number of graduates of various colleges and institutes, but the advancement and research in the electrical field is, in a great measure, due directly to the graduates of the Massachusetts Institute of Technology.

"I have not prepared any set speech or greeting,



REUNION BY TELEPHONE.—ALUMNI OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY LISTEN TO SPEECHES BY WIRE.—SCENE AT THE CHICAGO DINNER.

can Telephone and Telegraph company, which was readily obtained, as the chief engineer and many of the other officers and engineers of the company are graduates of the Institute in whose honor the dinners were given. Mr. F. A. Pickernell of New York, the chief engineer, made the general arrangements, while Mr. E. L. Andrews, the district inspector of the company in Chicago and also an alumnus of the college, supervised the details of preparation in the West. The officers of the Chicago association of alumni took an active interest in the affair. The retiring president, Mr. L. A. Ferguson of the Chicago Edison company, made an eastern trip a few days before the date set, had interviews with Mr. Edison and others interested, and did much for the success of the event.

In Boston, the home of the Institute, the alumni, to the number of about 150, dined at the Technology Club, 70 Newbury street; in Chicago 130 gentlemen sat down at the University Club, 116 Dearborn street; in St. Louis the enthusiasm was so great that it was at one time reported that 1,000 were present,

through these two transmitters, but, of course, everyone who had a receiver could hear. At Boston there were 20 receivers. The accompanying picture shows the members of the Chicago party, many of whom had the instruments at their ears when the photograph was taken.

During the dinner and afterward, except when cut off for conversation, the music of the orchestra at the Palm Garden, Milwaukee, was coming over the wire. The guests could pick up a receiver and listen to a few bars at almost any time. When the coffee-and-cigar period of the dinner was reached Mr. Andrews called up Mr. Edison's laboratory at South Orange, N. J., and asked for Mr. Edison. There was no trouble in getting the connection, and the voice of the speaker came over the wire clear and distinct. Mr. Edison's remarks were listened to with keen interest. Mr. Andrews made the opening salutation, "How do you do, Mr. Edison?" he asked. Mr. Edison's answer was as follows:

"Well, thank you. How are the members of the

and time being limited, I wish to convey my compliments to the alumni gathered in Chicago to-night. Good night, gentlemen."

An experienced stenographer was present at the Chicago dinner, and the foregoing is his verbatim report of Mr. Edison's words as heard through the telephone. The speaker and the shorthand reporter were 900 miles apart.

After Mr. Edison's little speech the alumni in Boston, Chicago and St. Louis received some instruction and a great deal of entertainment through the telephones. Speeches of Mayor Quincy, President Crafts of the Institute and President Miller of the General Alumni association were heard from Boston, not so clearly as Mr. Edison's, but fairly well. Cheers were exchanged; classmates chaffed each other, and "roasts" and "gags" relieved the set speeches, much as if all the "boys" had met in one place. President Crafts expressed the hope that at the next annual banquet the alumni would be able to see one another from afar by electricity as well as hear. Governor Roosevelt of New York was un-

able to talk over the telephone, as had been expected, owing to an imperative engagement that took him to a private residence in New York city where there was no instrument.

For three hours the banqueters "held the wire," and they enjoyed the privilege to the utmost. It was the largest and most successful "telephone reunion" ever attempted.

A cablegram was received by President Ferguson of the Chicago association just before the dinner. It was from George R. Mower, an alumnus at London, and read: "Electricity unites all. M. I. T. 'Rah, 'rah, 'rah!'" Stoughton Walker, a Michigan graduate who was unable to be present, sent a huge cluster of roses. The Chicago dinner was attended by many out-of-town alumni from various points in Minnesota, Wisconsin, Iowa, Illinois, Indiana, Michigan and Ohio.

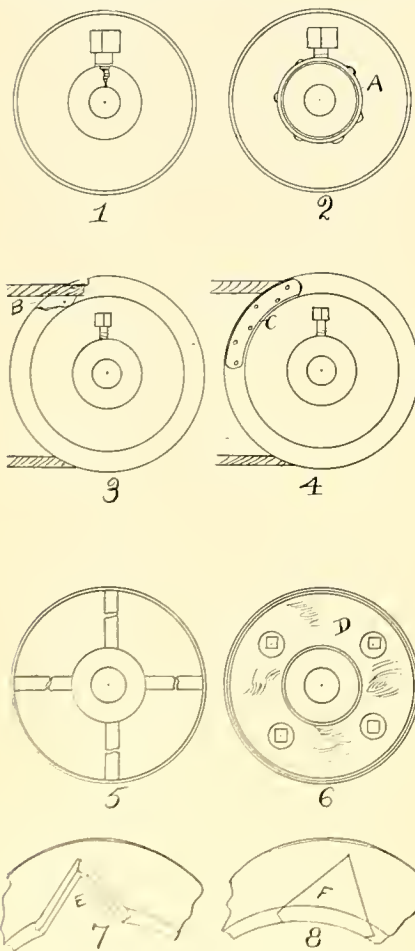
Mr. I. W. Litchfield acted as toastmaster at the Chicago dinner, and speeches were made by Dr. D. R. Dewey, who came to Chicago to represent the faculty, on "Old Technology;" Mr. Samuel Instill, president of the Chicago Edison company, on "The Technical Man in Business;" Professor B. D. Woodward, on "The Paris Exposition," and Ensign B. R. T. Collins, on "Familiar Scenes of Other Days." Ensign Collins' address was illustrated by fine stereopticon pictures of the new college building and scenes in the late war.

The annual election resulted as follows: President, I. W. Litchfield, '85; vice-president, E. L. Andrews, '04; secretary, E. M. Hagar, '03; members of the executive committee, Solomon Sturges, '87, C. M. Wilkes, '81, and L. D. Gardner, '08.

Repairing Electrical Machinery.

By B. F. FELS.

When the pressure of the set-screw in the belt pulley of a dynamo or motor is exerted severely, the hub often cracks under the strain. The pulley at once becomes loose, and further tightening of the set-screw only puts more tension on the fracture, causing the crack to extend perhaps the full width of the hub. If a new pulley is at hand, it is, of course, best to remove the broken one and substitute the new one. If no extra pulley is carried, the broken pulley can be made serviceable again



REPAIRING ELECTRICAL MACHINERY.

in less than an hour by forging a ring from flat iron, about one eighth of an inch thick, and as wide as the available space on the hub. This ring can be slipped over the hub, as at A, Fig. 2. The ring should be shrunk on, and then it will close up the crack shown in Fig. 1 at the base of the set-screw. Several rivets or small screws will do to secure the ring to the hub. The set-screw hole may be bored through this ring, and the same screw will do to secure the pulley to its shaft. If a piece of the

flange of a band pulley breaks off, as at B, Fig. 3, the edges of the fracture will cut and tear the band. The best way to repair this break is to replace the piece broken out, and secure it to its position by means of a side patch C, Fig. 4. This patch may be sheet metal of any kind and riveted both to the patch and to the flange of the wheel.

Not long since a heavy piece of machinery fell upon the driving pulley of an electrical machine and broke off all the spokes, as in Fig. 5. There was immediate need for the machine, and as no extra pulleys were on hand we made an effective repair in 30 minutes by simply turning out two pieces of hard pine board 1½ inches thick, to fit inside the rims and over the hub on either side, as in Fig. 6, in which D marks the wood disk of one side. Then we bored four bolt holes and inserted inch bolts and drew the wood disks together against the spokes. The pressure obtained by gradually screwing up the bolts caused the spokes to sink into the wood, bedding them very tight. This pulley has continued to run satisfactorily.

In another case a piece of the rim was chipped out of the pulley and the driving belt was badly cut by it. First, the broken place was shaped like a V by filing, as at E, Fig. 7, and then the edges were grooved so as to dovetail in a piece F, as in Fig. 8. A very tight fit was made, and then two small strips of metal were riveted across on the inner side of the rim to assure the inserted piece remaining in place.

When electrical machinery is coupled to a drive in such a way that there is quite a distance between the driving belt and the first hanger the tendency is to strain the nearest coupling, sometimes breaking it off next the shaft, as at A, Fig. 9, for example.

I recently had such a case. The connections were such that the broken stub of the shaft could not be removed from the coupling, and as no additional shafting of the proper size was kept on hand, the only way to repair the break for immediate service was to patch it up in some way. Fig. 10 shows how it was done without loss of time. This occurred in a power station that furnished light for some factories which ran at night, and it was necessary that the machinery be kept running. We secured another side of a coupling and keyed it to the shaft, as at B, Fig. 10, and then removed the bolts from the original coupling and substituted others long enough to reach through the old coupling and the new half, as shown. The bolts were tightened and the connection made perfectly tight in this manner.

CRUDE WAY TO FIX A BROKEN FAN BLADE.

As is known to electrical machinists, it is necessary to have a fan in fairly good balance to get good work. In one place where they were having trouble with a fan I noticed that one of the blades carried an excess of weight in the shape of some heavy strips of metal across a place where the blade had been patched (Fig. 11). These pieces were not only much too large, but were not well placed. They increased the weight of that blade and upset the balance of the fan, causing the whole thing to wobble and lose power. A better way was found by ripping off the weighty strips and substituting single beveled pieces across the fracture, as in Fig. 12. This reduced the weight and permitted the fan to turn evenly and without wobbling, though run at a higher speed. An artistic method for patching work of this description is presented in Fig. 13, in which specially cut pieces are made from sheet brass, aluminum or other metal, and riveted on by means of the cars, the rivets passing through and clinched.

RIVETING.

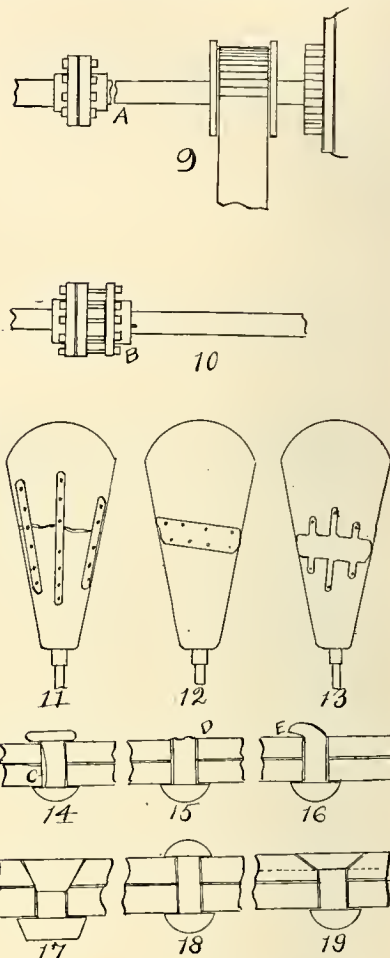
One of the troubles resulting from defective riveting is shown in Fig. 14. The rivets used were too long, and the machinist doubled some of them over, as at C, Fig. 14. These soon worked loose, and the fan rattled, resulting, finally, in the patching dropping out of position and ruining the fan.

Another poor way to do riveting is shown in Fig. 15, in which the rivet is too short, and the head at D is too small to prevent the rivet from pulling through. Many otherwise good riveting jobs are worthless owing to this defect. The writer recently saw a fan revolving with pieces of waste clinging to it. An examination showed that the person who had riveted the work had not stopped to shave off the rivets to proper length but had bent them over, as at E, Fig. 16. The fan was in use in a textile mill, and pieces of textile stuff caught upon these hooked rivets, not only making it harder for the fan to turn, but making it appear poorly cared for. The trouble was remedied by trimming off the hooks with a cold chisel and reheading the rivets. Some use the form of countersinking of rivets shown in Fig. 17. This is a good way in some respects, but will not do for the blades made of brittle metals, for the reason that the tendency of the taper to the rivets is to strain the metal in all directions, sometimes fracturing it. The simple rounded-head rivet is shown in Fig. 18, and may be used for general riveting purposes. A well-designed rivet which is countersunk and is generally effective for the kinds of work under consideration is shown in Fig. 19. The taper line extends only a part way through the plate, as indicated at the dotted line. The distribution of the strain is even, and the contracting power is provided for. I find that this process of riveting gives satisfaction.

Terminal and Transfer Station at Roxbury.

[From the Boston correspondent of the WESTERN ELECTRICIAN.]

Long life and vivid recollections of the event were wished by a large gathering of people to a pair of little folk who performed the unique ceremony of breaking ground in Roxbury for the terminal there of the elevated railway. The principals were the little son, aged four, and tiny daughter, aged two years and six months, of President William A. Gaston of the company. The latter wielded a diminutive pickaxe and the lad turned aside the first shovelful



REPAIRING ELECTRICAL MACHINERY.

of earth on the site of the prospective station, whereupon the crowd greeted them with a cheer.

The contract for the steel structure has been awarded to the Pennsylvania Steel Works, and the plans, as shown in the accompanying cut, provide for a unique terminal station and for the great loops which are to lead up to that station, both from the east and west. The station is to be located on the northerly side of Zeigler street, between Warren street and Washington street, Roxbury, and it will be about three stories high. It will be more than a mere elevated station. It will contain on the first and second floors waiting rooms and toilet rooms.

The building is to be entirely of steel. Cars will pass through the basement and the second story, and those from the west will come up the incline and land passengers for the elevated in the center of the building. East-bound passenger cars will be treated similarly. Two loops run out from the station for the accommodation of both east and west-bound passengers.

How Shall the Value of a Taxable Franchise Be Ascertained?

[From the Minneapolis correspondent of the WESTERN ELECTRICIAN.]

The Supreme Court of Minnesota will listen to argument as to the manner of arriving at the value of a franchise for taxation purposes at the April session. Cases against the Duluth Gas and Water company, Hartman General Electric company, West Duluth Water and Light company and the West Duluth Electric company bring the point up. The county authorities first ascertained the amount of bonds and estimated value of the stock as expressing the total value of the property. Then they concluded that whatever was not real estate or specific property must be the value of the franchise. The trial court held that the company had a right to offset the amount of the debt, but the city objected that the company might cover the whole value of the property by bonds, issued to its own members, and leave the value of the franchise less than nothing under that rule.

No Compensation for Cable Cutting.

It seems that, under the law of nations, there is no redress for a neutral telegraph company whose cable has been cut in the territory of an enemy as a military necessity.

Telegraph Cables in War.

[From the New York Sun.]

The discussion by Commander C. H. Stockton, in the proceeding of the United States Naval Institute, of the law concerning submarine telegraph cables in time of war, deals with a question comparatively new, and thus far meagerly treated by the publicists, although of great and growing importance.

Exactly two years to a day before Dewey fought his last battle the Paris agreement for the protection of submarine cables went into effect. That international agreement, made March 14, 1884, and ratified April 1, 1885, to go into effect on May 1, 1888, our country being a party to it, expressly declared, in Article XV., that its stipulations should "in no wise affect the liberty of action of belligerents."

During the war of 1870 between Germany and France, the war between Chile and Peru and the subsequent Chilian civil war, cables were cut in the high seas as well as in belligerent waters. And this was really the logical result of the rule that makes materials for constructing telegraphs, under certain circumstances, contraband of war.

On the other hand, a cable between two neutral ports, although one link in a chain reaching to the country of a belligerent, or from that country to its own colony, ought to be held inviolable.

At all events, one belligerent is not unreasonable in demanding that the neutral should not permit messages from the other belligerent passing through neutral territory, of a nature injurious or disadvantageous to himself.

When possible cable communication generally should, of course, be kept open for commercial or other innocent intercourse, and in many cases a government censorship can meet the circumstances and requirements of the war and prevent injury to a belligerent.

Examining Admiral Dewey's action in the light of these principles, we learn that the Manila-Hongkong cable was owned and controlled by English and Danish companies and subsidized by the Spanish government.

especially reluctant to do this, after having been subsidized by Spain. The admiral was right, however, as to all he did in this matter, as in others, and it would have added an interesting precedent if his offer to become a joint customer with the governor-general in sending dispatches for Washington and Madrid respectively had been accepted.

Drainage Canal Power Project.

There has been much talk of the possibility of utilizing the fall of the water in the new Chicago drainage canal, which connects the Chicago River with the Illinois River, and hence Lake Michigan with the Mississippi River, for power to be electrically transmitted to Chicago.



TERMINAL AND TRANSFER STATION AT ROXBURY.—SOUTH END ELEVATION.

committee of the trustees it was decided that Messrs. Boldenweck, Carter and Smyth should prepare a letter asking for proposals to be sent out by Chief Engineer Randolph.

Lyman E. Cooley, on the proposition to develop water power, said: "I am opposed first and last to anything that will be in the way of a ship canal, such as the sanitary canal was intended to be and such as it must be if faith is to be kept with the people of the Desplaines and Illinois valleys."

Trustee B. A. Eckert said he did not understand that the water-power plan would interfere with the navigability of the channel. He continued: "I would be opposed to anything that would prevent

the channel from being a navigable stream, but I believe that the idea is to make it both a good waterway and the producer of power. This being the case, adverse criticism fails for want of proper foundation."

Somerville's Woes.

The Brunswick Traction company, which recently absorbed the link of the New York and Philadelphia Traction company between Somerville, N. J., and Bound Brook, has raised a storm of indignation among Somerville citizens as a result of its attempt to introduce innovations in the management of the property.

Work on the job of changing the cable railway in San Pablo avenue, Oakland, Cal., to an electric line has been begun.

Municipal Supervision Proposed for Illinois Electric-light Companies.

A bill has been introduced in both houses of the Illinois Legislature which, if passed and approved by the governor, will have an immediate and important effect on the business of the gas and electric light companies of the state.

A bill for an act to regulate the business of furnishing gas and electricity for light, heat and power, and to provide for municipal supervision of such business.

Section 1. Be it enacted by the people of the state, That any person or corporation engaged in the business of furnishing gas or electricity for the purpose of lighting, heating or generating power is hereby declared to be engaged in a public business, and all corporations so engaged are hereby declared to be public corporations.

Section 2. In every city and village in this state in which there is any person or corporation engaged in the business of furnishing gas or electricity for the purpose of lighting, heating or generating power there shall be appointed and elected one electrical commissioner in the manner hereinafter provided.

Section 3. In every village there shall be one gas and electrical commissioner, who shall be appointed by the president of the Board of Trustees, and his appointment be approved by the Board of Trustees. In every city having a population of more than 100 there shall be three gas and electrical commissioners, who shall be appointed by the mayor, and their appointment be approved by the Common Council.

Section 4. Such commissioners shall be appointed as soon as they take effect, and their term of office shall expire on July 1, 1901, or as soon as their successors are appointed and qualify thereafter the term of such commissioners shall be two years.

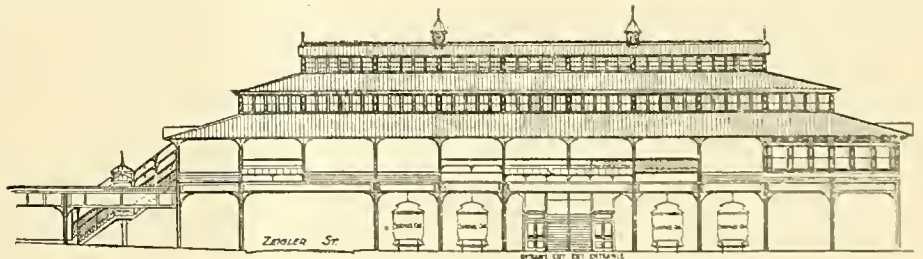
Section 5. Such commissioners shall have power during the daytime to enter upon the property of any person or corporation engaged in the business described in Sec. 1 hereof to examine, inspect or test any and all machinery or appliances used in said business, and to examine and inspect all documents, papers, books and records used in the conduct of said business. They shall have power, upon reasonable notice, to enter upon any property on which gas or electricity is used to examine and test any and all machinery and appliances used in supplying such gas or electricity.

Section 6. It shall be the duty of said commissioners First—To see that all laws of the state relative to the business described in Sec. 1 hereof are complied with. If they shall find that there has been or is a violation of law punishable by fine or imprisonment, they shall forthwith report such fact to the state's attorney of the county, whose duty it shall be to diligently prosecute the offending party.

Second—To see that all municipal laws and ordinances relative to such business have been complied with and to prosecute violations of the same.

Third—To see that any and all terms, provisions and conditions of any license granted by any municipality to any such person or corporation are fully complied with. If they shall find that any such license has been violated they shall forthwith report such fact to the attorney-general, whose duty it shall be to forthwith begin and diligently prosecute proceedings to forfeit such license.

Fourth—If any complaint is made to such commissioners that any person or corporation engaged in such business is using a



TERMINAL AND TRANSFER STATION AT ROXBURY.—EAST SIDE ELEVATION.

meter or instrument for measuring the gas or electricity furnished which is not accurate, it shall be the duty of such commissioners forthwith to inspect such meter and instrument and cause the same to be corrected, and the decision of such commissioners that such meter or instrument is inaccurate shall be conclusive on the person or corporation using the same. If such meter or instrument is found to be inaccurate the commissioners shall notify the person or corporation using the same of that fact and the amount of the expense of examining the same, and it shall be the duty of said commissioners, in case such person or corporation does not promptly correct such meter or instrument, to have such correction made and notify the person or corporation using the same of the amount of the expense of making such correction. The person or corporation using such a defective or inaccurate meter or instrument shall promptly pay to the municipality in which such business is conducted the expense of such examination and correction, and in case of failure to do so said commissioners shall compel such payment, by suit in the name of the municipality in any court having jurisdiction, of the amount involved.

Section 7. Every municipality in which such commissioners are appointed shall by ordinance provide for the carrying out of the provisions of this act, and shall have power by ordinance to establish all reasonable rules and regulations for the conduct of such business as is described in Sec. 1 hereof, and provide penalties for non-compliance with the same. Such ordinance shall provide for furnishing such commissioners with clerks, and such assistants as may be deemed necessary, and such salaries and expenses thus fixed by ordinance shall be payable out of the municipal treasury.

Section 8. Such commissioners shall receive as compensation a salary to be fixed by ordinance, not less than \$200 and not more than \$2,000 per annum each.

Section 9. No person or corporation furnishing gas to others shall, during any one month, charge for such gas at a rate which exceeds 25 cents for the first 1,000 cubic feet used, and a rate which exceeds 6 cents a thousand cubic feet for all gas used in excess of the first 1,000 cubic feet.

Section 10. It shall be the duty of the commissioners to be appointed under this act in their respective municipalities to carefully examine into the methods used by those furnishing gas for the purpose of lighting, heating or generating electric power, and to ascertain the cost of generating, distributing and supplying it to others, and to report to the secretary of state their opinion of what would be reasonable charges to be made for supplying such electricity, allowing a fair profit to the person supplying the same. Such report shall be filed with the secretary of state during the month of December. A D. Ross, an Illinoisan, states the facts upon which the commission is based and an investigation which the commissioners may have which would cause the General Assembly in regulating the charges to be paid for supplying such electricity.

Latest Progress in the Application of Storage Batteries.

By JOSEPH APPLETON.

PART II.

It used to be customary to refer to European practice, to show what could be done with storage batteries, and even now I believe that some people think that European batteries and methods are superior to those in this country. In connection with this idea there is one thing that I particularly wish to emphasize, and that is the difference between American and European conditions.

In Europe storage batteries are not subjected to the severe work they have to stand here. They are looked upon more as a reserve, and are not expected to discharge at their maximum rate every day and perhaps twice on some days.

As an example of this, I will tell you what one of the Tudor company experts from Germany said, when he was over here last spring. He was attending the National Electric Light convention at Chicago, and one of the features of interest at that time was the large storage-battery plant which the Chicago Edison had recently installed. During one afternoon, while the convention was being held, a very heavy thunderstorm came on, and the battery was called upon suddenly for its maximum rate of discharge, and the full rated capacity was taken out. The maximum rating of this battery was a complete discharge in one hour. Our German friend thought that was doing pretty well, but when we told him that this storage battery was installed under contract which allowed the battery to be discharged at this rate every day during the winter, he was horrified and said:

"You must not let them work the battery in that way; tell them they must hold it as a reserve." We told him that if we did that we should not be able to do any business, and that we simply had to meet these conditions, and could do so without any difficulty. This instance will show why batteries are maintained at a lower figure in Europe than here, and why it has been customary to refer to the behavior of the battery in Europe.

It is a fact that we have now in this country many storage-battery installations which surpass anything in Europe both in size and method of operation.

The methods of applying storage batteries in connection with electrical engineering work are so numerous that it would be impossible to deal with them all this evening, so I have selected a few for consideration as showing clearly the great flexibility of the storage battery as an adjunct to any scheme contemplating the generation and transmission of electrical energy. We will first consider the storage-battery installation of the Chicago Edison company.

This installation is particularly interesting, as being the largest individual battery ever installed for a lighting station. The peak of the load during the winter, as will be seen from the accompanying curve, occurs about 4:45 p. m. and lasts from 45 minutes to one hour and a half.¹

One of the end-cell switches, which are located near the battery and are operated from the distributing-switchboard room by small electric motors, is herewith shown. It is so arranged that when it is desired to cut in or out any number of cells, it is simply necessary for the switchboard attendant to press a little button, which will operate the motor and move the switch over from one contact to the next, the switch stopping automatically when it is in a proper position on any contact. Indicators are provided on the switchboard to show the attendant how many cells are in circuit on each switch.

By discharging this battery at two or three different pressures it is possible to load the feeders up to their full capacity, a thing which was impossible when the distribution was made from one pressure.

The battery is used, in addition to carrying the peak of the load, for maintaining a constant pressure on the system, and relieves the switchboard attendants at the generating station from constantly watching and regulating the pressure, the battery taking care of any fluctuations automatically.

In a lighting and power station such as this, the maximum load occurs for only a very short period during the year. In one station I know of 50 per cent. of their investment in generating plant and underground conductors is only used for 154 hours during the year. This statement may seem astonishing, but will be found to apply to many such stations. The application of storage batteries to such stations can be made in two ways, viz., at the main power house or in sub-stations.

When batteries are placed in sub-stations they will relieve the generating plants of the maximum load and also effect a large saving in the underground system of conductors, as, at the time of maximum load, the conductors between the main generating station and the sub-stations are relieved

of that portion of the load which is carried by the batteries and distributed from the sub-stations.

The use of large water powers for generating stations from which electrical energy is transmitted and distributed over extended areas is growing. In connection with such installations storage batteries play a very important part.

The power from such a plant is largely sold for manufacturing purposes, and is charged for at so much per horse power per annum, the power being available 24 hours per day, while the mills and factories using this power do not usually run for more than 10 hours per day. Therefore a man who requires a maximum of 100 horse power for 10 hours a day, or 1,000 horse power hours, really has to pay for 2,400 horse power hours, while he uses only 1,000, and probably less, for the average rarely, if ever, exceeds 70 per cent. of the maximum.

With a storage battery capable of supplying 50 horse power for 10 hours, or 500 horse power hours, he need only pay for one-half the amount, or 50 horse power for 24 hours, as the battery will furnish the remainder, and can be charged during the 14 hours he is not using the power. In addition to this, the battery will take care of any fluctuation above the average, and enable the man to buy the average amount of power he requires, instead of the maximum.

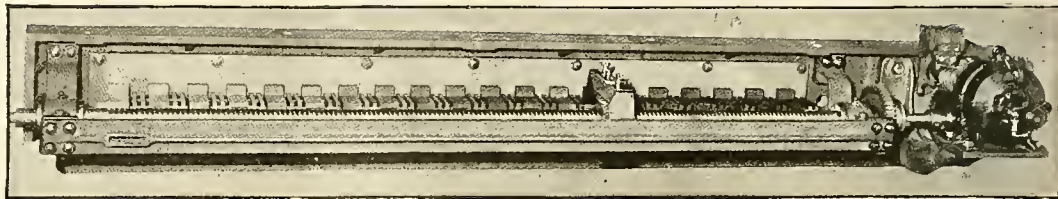
Such an installation has been made by the Buffalo Street Railway company. Before describing this installation I would like to mention the different methods of installing storage batteries in connec-

tioner in series with the battery, which is so designed as to increase its voltage in proportion to the increase of load, thereby enabling it to take its proper share and keep the load on the generators constant.

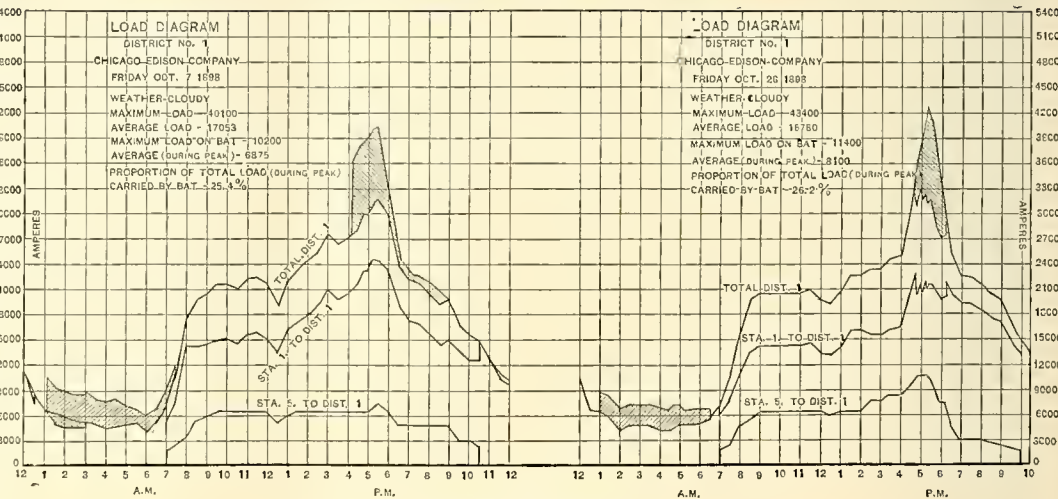
The battery discharges during the morning and evening peak, and is charged between times and also at night from the Niagara Falls power.

By the aid of the battery the company is enabled to make very much more use of the Niagara Falls power. Before it installed the battery it was only able to shut down its steam plant from 11:30 p. m. until 5 a. m. during which time the rotary converters carried the entire load, which averaged about 600 horse power, while it was paying for 2,000 horse power. With the aid of the battery it is enabled to shut down its steam plant from 7 p. m. to 7 a. m., and about 18 hours on Sunday. In addition to this it is enabled to utilize very much more of the Niagara power.

An illustration of the second method of using storage batteries for railroad work is seen in the case of the battery installation of the South Side Elevated company of Chicago. This company operates an elevated railroad about nine miles long, all its trains being equipped with the Sprague multiple-unit system. The power house is located approximately at the center, with two storage batteries near the ends of the line, connected directly across the system without a booster. The charge and discharge of these batteries is controlled by the drop over the feeders from the power house to the bat-



End-cell Switch.



Chicago Edison Load Diagram.

LATEST PROGRESS IN THE APPLICATION OF STORAGE BATTERIES.

tion with railway plants. These may be divided into two classes.

First—Where the battery is installed at the power house to take the care of the peak of the load and the fluctuation of the generators.

Second—Where the battery is installed at the end of a long feeder to keep up the pressure at that point, and to obviate the necessity of sending the maximum amount of current over the long feeders from the power house.

We will consider an installation of each kind and the respective methods of operation.

The Buffalo Street Railway company's plant is of the first class and is especially interesting, inasmuch as it is operated in connection with the Niagara Falls power plant. The company operates practically all the cars within the city limits and has a steam plant capable of delivering 7,000 electrical horse power, in addition to which it takes 2,000 horse power from the Niagara Falls power, this current being transmitted in the form of high-tension alternating current from the Niagara Falls to the power house, and being then transformed by rotary converters to the ordinary 550-volt direct current.

When a storage battery is installed at the power house and is connected directly in parallel with the generators on the bus-bars, as in this plant, some means have to be provided for regulating the voltage of the battery to suit the generators. As you know, railroad generators are over-compounded, the voltage rising as the load increases, while with the storage battery the reverse is the case, the voltage decreasing as the discharge increases. In order to make the battery work properly in parallel with generators of this type and take the fluctuations of the load, keeping the generators constantly loaded, some means of compounding the battery has to be adopted. This is done by using a compound wound

batteries, this drop varying, according to the load on the system, from 10 to 80 volts. When the load on the system is light the drop in the feeders is small, and there is voltage enough to charge the battery. When the load becomes heavy the drop on the feeders is increased; this consequently causes the batteries to discharge into the line. The method of operating is entirely automatic, the batteries discharging at times of heavy loads and charging at time of light load, thereby keeping the load on the generating station practically constant.

One of the most interesting and important storage-battery installations recently made is that in connection with the underground trolley system of the Metropolitan Street Railway company of New York. The system covers a large area, and the company has utilized storage batteries in sub-stations. Two are now in operation, one at the foot of West Twenty-third street and the other at Thirty-second street and Fourth avenue.

The battery consists of 540 cells, each containing 51 plates, 15 inches square. The dimensions of the cells are four feet by 21 inches by 24 inches. The battery is divided into two sections, 270 cells in each, which are operated in parallel. This is done to keep the sizes of the cells within practical limits and to enable them to be more easily inspected and cared for. The capacity of the complete battery is 8,000 ampere-hours, with a one-hour rate of 4,000 amperes. The function of this battery is to take care of a portion of the morning and evening peaks, and to take up the fluctuations of load at all times. The method of operation is as follows:

Sufficient cells are provided so that the voltage of the battery just balances the average voltage of the system; consequently, when the battery is connected to it, it acts as an equalizer and does not charge or discharge except as the fluctuations occur. When the battery discharges on a peak and is being

1. The method of operation and a description of the storage battery plant were published in the WESTERN ELECTRICIAN, June 6, 1897.

charged during the hours of light load a booster is connected in series with it to regulate the amount of a charge and discharge. The output of the booster and, consequently, the charge and discharge of the battery are controlled by varying the strength and polarity of the shunt field. This is done by a special form of switch which makes the operation very simple. The daily work of the battery is about as follows:

- From 7 to 9 a. m. it discharges on the peak.
- From 9 to 12 it floats on the system as an equalizer.
- From 12 to 3 or 4 p. m. it is charging.
- From 4 p. m. to 8 p. m. it discharges on the peak.
- From 8 to 12 (midnight) it is floating on the system.
- After midnight the battery is given its principal charge, this being continued until the battery is full.

We will now consider the use of storage batteries in connection with isolated plants in large office buildings and stores using electric elevators. The modern office building, with its 15 or 20 stories, together with the demand for quick elevator service, has greatly increased the use of high-speed electric elevators. The nature of the work the elevator has to perform and the fact that the power required to start it is from two to three times the hoisting power cause the elevator load to be an extremely fluctuating one, no matter how carefully the operation is watched.

The Commercial Cable building in New York is an excellent example of what can be done with the operation of an electric plant of this description. The building is wired for about 3,500 16 candle power lamps, 240 volts, and has six screw-type high-speed Sprague elevators. The generating plant consists of two 300 horse power water-tube boilers, two 225 horse power engines directly connected with two 150-kilowatt generators, and the storage battery consists of 120 cells, each containing 27 plates, 15 1/2 inches by 15 1/2 inches. The capacity of this battery is as follows:

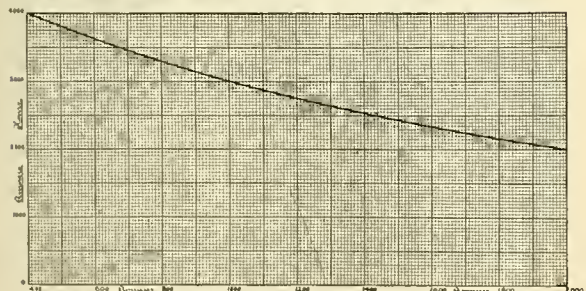
- At 260 amperes, 1,620 ampere-hours.
- 520 amperes, 1,040 ampere-hours.
- 650 amperes, for the one-hour rate.

The function of this battery is to take care of the fluctuating elevator load between 9 a. m. and 9 p. m., when the plant is running, and at night to supply the whole current required for lighting, and the occasional trips of one elevator.

Before the battery was installed it was found necessary to run one generator for the lighting circuit and one for the elevator circuit, the fluctuations of the latter causing the lamps to be unsteady if both were run from the same machine. The method of operation is as follows:

The elevator circuit is connected directly across the terminals of the battery, and the battery is being constantly charged by means of a constant-current booster, which boosts the current from the lighting generators. By a special winding on this booster the amount of current which it allows to pass from the generator to the battery and elevators is maintained practically constant.

For example, with a fluctuation of 600 amperes in the elevator circuit, the load on the generators is increased by about 50 amperes, or less than 10 per cent., this amount having no effect on the steady-



Capacity Curve for a 29 H Cell.

Education of Electrical Apprentices and Journeymen.

By ARTHUR A. HAMERSCHLAG.

The world has watched with startled eyes the rapid and far-reaching strides the young electrical industry has made and the numerous fields in which electricity has entered. From a total investment of a few thousand dollars it has, to-day, grown to such proportions, that it would be impossible to compute with accuracy the value of the industries in which electricity plays a prominent part. It is almost as difficult to assimilate the figures of value in their proper proportion as it is to define the widening field they have developed for skilled electrical labor. From an industry that gave employment to a few hundred men, in a decade it has expanded until it demands the services of tens of thousands of men, devoting their services exclusively to this work.

It has also demanded men of intelligence of a comparatively high order, well equipped with mechanical skill. That we have made such astonishing progress is remarkable, but not nearly so wonderful as that we have found, in the past, men, sufficiently large in number, capable of developing, manufacturing and devising electrical products on a marketable basis.

Should another generation find a proportional increase in the demands for electrical products and operations (and the prospects are good for such an increase), shall we be equally fortunate in finding the skilled men necessary? Is it just as certain these men will be found?

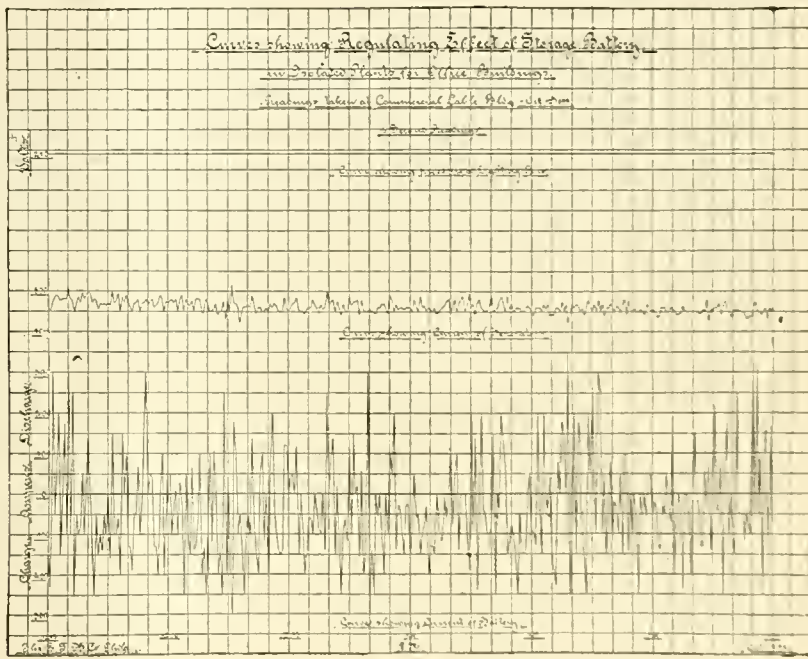
The birth of an industry is not the most potent factor in determining its development. It needs the nourishment and care of those engaged therein to make it grow to maturity. With its growth it must develop and mature the individuals upon whom it most depends. Merit alone will not enable it to be perpetuated and put upon a successful basis, unless it is capable of placing its raw material in the hands of skilled workers upon whom absolute dependence can be placed.

It is to accomplish this most essential factor of future success, that I believe it time that we give a thought to meeting the coming demand by edu-

now undergoing the same trial, and tribulations regarding the educational means that other trades and professions have undergone, except that the problem in the electrical industry, owing to its rapid growth, is of vastly greater urgency. Because of this growth along scientific and mechanical lines, improvements succeed improvements so rapidly that what was considered good practice yesterday becomes obsolete and defective to-morrow. The men or mechanics who but a few years ago handled cleats and moldings in wiring are to-day a kedd to use iron pipe and conduit, requiring totally different tools, materials and methods. And where do these men acquire the efficiency and facility for this work? They acquire it in the crudest and most uneconomical method possible, by experimentally using their employers' material and time. These improvements certainly result in the loss of journeymen's efficiency, and result in "rule-of-thumb" mechanics. This type of mechanic is to be found in all trades, and sometimes he is exceptionally skilled in his work. This causes a tendency on the part of the employers to desire more men like him, especially when he is placed side by side with the so-called theoretical mechanic who may lack skill. The fallacy of this reasoning is at once apparent when the "rule-of-thumb" mechanics come in competition with the well-grounded and educated mechanics who possess an equal amount of skill. Then the efficiency of the latter is so much greater that there can be no comparison.

Oftentimes we meet men with such a vast preponderance of theoretical training that it has removed the inherent practical skill, and this type of journeyman is almost useless when judged from the working standpoint. This latter condition is not a rare one, by any means, and just a few words concerning it may be appropriate.

A glance over a list of educational institutions causes us to feel proud of our achievements. In almost every settlement or city throughout the country some school, college or university is supported upon as lavish a scale as one could desire. Endless seem the opportunities which the young American has to acquire the learning and higher education which are prized and cherished in the



Battery Plant in Commercial Cable Building.

LATEST PROGRESS IN THE APPLICATION OF STORAGE BATTERIES.

ness of the lamps. The amount of the current boosted in this way is the average elevator load for the time the plant is running, plus the amount of current required to charge the battery after it has carried the previous night's entire load.

The curves show graphically the operation of this plant. The lower curve shows the fluctuating load on the battery, which varies from 350 amperes discharge to 300 charge. Of course, when there is no elevator load, which occasionally happens (all the elevators standing still), the entire amount of current passed through the booster is used for charging the battery. When a heavy elevator load comes on this boosted current is diverted from charging the battery into the elevator circuit, the battery discharging in parallel with it, as may be required. In this installation the booster is passing about 250 amperes; thus when the battery was discharging at 350 amperes the total elevator load was 350 plus 250, or 600 amperes. The second curve shows the variation of load on the generator at the same time. This, you will notice, reaches the maximum of 70 amperes, while the voltage on the lamps is maintained practically constant, the curve being almost a straight line. Such an application is an ideal one for a storage battery, as it not only decreases the size of the generating plant required, but enables the generating plant, when it is running, to be operated at a steady and economical load, instead of a fluctuating one.

cating the apprentices and journeymen to that point which will make it possible for our boldest conceptions in electrotechnics to be skillfully and economically solved.

The old world has given us excellent mechanics through its apprenticeship system; unfortunately, even in those countries, that system is dying out. This country has never had a well-developed apprenticeship system, and to-day it has almost entirely disappeared because of the peculiar restrictions placed thereon by the unions and associations and the centralization of the work under single financial heads. Men are paid by the hour or day, and employees shift from place as the demand for their services varies from busy to dull times. In fact, to-day the apprenticeship system is almost impossible for financial and other reasons, so we must devise some other means of educating the youth who wishes to enter the electrical field.

It is true that three or four of the largest electrical concerns do apprentice young men, but the number is comparatively small, and it requires considerable influence to secure such indentures. The number of applicants is, however, out of all proportion to the number that can be accommodated, and such openings are almost entirely out of reach of the vast majority because of isolated locations.

Electrical work, as a trade and as a profession, is

world to-day. We have schools for every conceivable purpose; we have colleges and universities for every profession, and we have technical institutions almost unmatched in efficiency. But we have only a very few practical trade schools, and for the education of electrical mechanics fewer still. Parents persist in sending their children, regardless of their inherent qualities, to the colleges and universities to master a profession, without giving a thought to the field in which their future labors must be conducted and without considering the compensation they will receive. And what is the result? There can be only one general reply.

After years of study and much money spent in acquiring the profession and an early association with children of wealth and refinement, the born mechanic is lost in the attempt to produce a genius or a great engineer. The field for mediocre engineers is just as narrow and confined as it is for the mediocre artist; the compensation for his labor is equally curtailed and, as a result, when the young man is thrown on his own resources he must suffer that genteel poverty which his training in refined circles has bound him to. He can no longer take pride in the work of his hands, and his brain power being not above the average, he suffers acutely, and eventually becomes neither an excellent mechanic nor a fair engineer.

Each year the colleges and universities are set

[Continued on page 82]

1. Lecture before the American Institute of Electrical Engineers, New York, December 28, 1898.



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DEPARTMENTS.

Table listing departmental contents with page numbers. Includes 'Correspondence', 'Electric Lighting', 'Publications', 'Electrical Securities', etc.

ment of the Chicago Telephone company upon this subject have been changed materially, judging from recent developments. The company has proposed a new schedule to apply to small users, but thus far no relief has been offered business men, and it is not to be expected that the concessions thus far made will be accepted. The people of Chicago can thank the Illinois Telephone and Telegraph company for the meager concessions that have already been offered by the old company, for no serious attempt is made to conceal the fact that the fear of competition prompted the proposition which the Chicago City Council is now considering.

"Chicago, October 17th."

This is the decision of the executive committee of the American Street Railway association upon the question of naming the time and place for holding the seventeenth annual convention and exhibition of that organization. The particulars of the meeting of the officers of the association in Chicago this week, the details of the arrangements for the exhibition and the list of subjects to be considered at the convention are presented on another page. They will be interesting to street-railway managers in all parts of the country and to manufacturers of street-railway machinery and supplies.

To those living in Chicago, however, the decision is of unusual importance. The gathering in October will be representative of the industry, and the local street-railway interests must make the meeting the most important event in the history of the association.

Chicago has the facilities and the men to do it, and by united effort this year's convention can be made a record-breaker.

The practice of building street-railway lines on Sunday to avoid injunctions has provoked much unfavorable comment, and now the Legislature of New York has turned its attention to the subject, with the view of enacting a measure to prevent further desecration of Sunday. Senator Brown has introduced a bill which provides that an injunction order may be granted by a justice of the Supreme Court on Sunday when, in his judgment, it is necessary to prevent irremediable injury, and a summons, with or without a complaint, may be served on that day if so ordered by the justice. One of the earliest cases to attract general attention to the loop afforded by the existing law was when Deacon Richardson, 20 years ago, in order to avoid the opposition of citizens and an injunction order, constructed on Sunday the Seventh avenue portion of the Atlantic avenue railroad in Brooklyn. The latest notable example in Chicago was the attempt of the General Electric Railway company to lay tracks in Custom-house place and Plymouth place, which resulted in a disgraceful row between the conflicting interests. No doubt a measure to prevent a repetition of such scenes would prove popular in Illinois, and, for that matter, throughout the country.

Like many other well-meaning but ill-advised municipal reformers, Sam Jones, Toledo's talkative mayor, is ridiculously inconsistent. In a recent discourse at Boston he advocated "Municipal Ownership of Everything in Sight," declaring that municipalities could manage enterprises for the public weal better than corporations or individuals. This is a favorite topic with the Toledo reformer and he has talked a great deal upon it, but he does not seem to gain additional information upon the subject, and as his ideas were hazy, to say the least, when he entered public life, it may be assumed that he has propagated considerable misinformation in his lecturing tours. Of course, if he had remained at home and attended strictly to his business this deplorable condition would have been avoided, and he might have learned that municipal management under the most favorable conditions was not an ideal policy. But he had absolutely no practical experience, and since his elevation to the office of mayor of Toledo he has been gallivanting about the country, neglecting the city's business and stirring up trouble wherever he went by his extravagant denunciation of quasi-public enterprises. No wonder he advocates municipal ownership; private enter-

prises would not stand such nonsense in an employe. Sam and his political pals would have to earn their salaries if they worked for any other concern. Such public office-holders really furnish an insurmountable obstacle to the advancement of municipal ownership, as conservative men will have nothing to do with a movement dominated by blatherskites.

The absence of precedents and the lack of an international tribunal for the settlement of such questions have made it difficult to predict with any degree of certainty the course which the United States would pursue in the adjustment of the claims of telegraph companies whose submarine cables were cut by the American forces during the late war with Spain. These corporations are English concerns, and their demands for reimbursement for actual financial loss sustained in repairing and replacing the cables cut by order of the American commanders at Manila and Santiago have been formally presented through the representatives of the British government. The subject has been carefully investigated by the law department at Washington, and Attorney-general Griggs has made a report in which he holds that the Eastern Extension, Australasia and China Telegraph company has no ground for a claim to indemnity because of the cutting of the cable at Manila in May last by Admiral Dewey, and upon the same grounds it may be safely assumed that the legal right of the Cuba Submarine Telegraph company to damages will also be rejected. The legal points involved are thus disposed of by Attorney-general Griggs:

Property of a neutral, permanently situated within the territory of an enemy, is, from its situation alone, liable to damage from the operations of war, which this cutting is conceded to have been, and no compensation is due for such damage. It is said that the whole utility of the cable is destroyed for many miles by a cutting within territorial waters; in other words, that the damage extends outside of territorial waters. But is this true? Undoubtedly, the interruption to traffic over it does or may extend many miles, but the interruption of the traffic is not the basis of the claim. When repaired, it was repaired, as it had been cut, within territorial waters, and was then the same as before the injury. It was possible to take up the outer end and operate the cable to Hongkong from the time it was cut; and it was the sealing of the cable at Hongkong and not the cutting that prevented this from being done. It seems to me, therefore, that the injury by cutting can properly be regarded as in no way withdrawn from the rule by reason of the supposed extension beyond territorial waters, even if an extension of the injury could, in any case, alter the rights of the helligerent.

The obvious difference between a cutting within and a cutting without the territorial water, however it may be troublesome to the owner, goes to the foundation of the rule authorizing the destruction of property because it is within the territory. It is equally troublesome to the owner of any property to have it injured or destroyed in or out of the enemy's country. This, however, does not affect the helligerent's rights with regard to his property within the enemy's country. To say that the American admiral desired to use the cable himself, as well as to prevent the Spanish government from using it, is but to attribute to him a motive in addition to one which justified his act. This can in no way diminish the right to cut the cable, nor, seeing that he did not use it, can it give rise to any different rule as to compensation.

When the question of compensation was first suggested, the representatives of the British government did not encourage the management of the companies interested in the hope that their claims would be allowed; in fact, there seems to have been a general understanding that a legal claim could be established only with great difficulty, if at all, and that the corporations would have to rely upon the generosity of the American government to secure any compensation whatever. In cable circles it seems to be the general belief that if the companies mentioned are left undisturbed in the possession of their franchises, and if the concessions they had obtained from the Spanish government were recognized by the Americans, they would have no reason to complain.

However, with the establishment and recognition of the position of the United States in this matter, and providing the government can do so consistently and without establishing a precedent, it might be well to consider the matter of reimbursing the telegraph companies for actual damages sustained. It would be a graceful and generous act on the part of the government and would satisfy the sense of justice of the American people.

We consider the present telephone controversy in Chicago to be the earnest consideration of those who have persistently maintained that the Bell interests were too firmly entrenched in the large cities to admit of the possibility of an independent movement disturbing them. The views of the manage-

American Street Railway Association

The eighteenth annual meeting of the American Street Railway Association will be held in Chicago on October 17th and will be continued four days. This decision was reached at a meeting of the executive committee at the Auditorium Annex on Monday. The following-named gentlemen were present at the meeting: C. S. Sergeant, Boston; Walton H. Holmes, Kansas City; T. C. Pennington, Chicago; George A. Yuille, Chicago; T. J. Jones, Memphis; Ira A. McCormack, Brooklyn, and John J. Beggs, Milwaukee. Messrs. Moore and Woodruff were unable to be present owing to imperative business engagements that demanded their attention.

The first action of the committee was to receive the report of Mr. Yuille on the subject of accommodations, which was outlined in the *WESTERN ELECTRICIAN* last week. The committee visited Tattersall's and held a conference with the owners of the building, which resulted in adopting the report of Mr. Yuille. The building has 50,000 square feet of unobstructed floor space that can be utilized for exhibition purposes; its location is favorable for the handling of freight, street-railway accommodations are excellent and ample power for the operation of machinery exhibits will be available. At first it was proposed to secure current from the Chicago City Railway company's plant, but as a special order from the council would be necessary, and as the underwriters would probably object to the use of current from street-railway circuits in this manner, it was deemed advisable to ask the Chicago Edison company to make arrangements for the event.

It is anticipated that there will be a fine collection of exhibits, and in order to give the delegates ample opportunity to inspect them, there will be no meeting on Friday and no entertainment provided by the local committee. To ensure a general attendance of members it was also decided to hold the banquet on Friday evening and to install the new officers at that time.

The following-named subjects were selected for discussion at the meetings of the association, and prominent members of the association will be invited to prepare papers upon them:

- "Maintenance of Car Equipment."
- "Modern Street-railway Shops; Their Design, Machinery and Shop-practice."
- "Train Service and its Practical Application."
- "Construction and Maintenance of Street-railway Tracks."
- "Investments in Street Railways; How Can They Be Made Secure and Remunerative?"

Another important subject that will command the attention of the convention is the report of the committee on rules for employes. This document was not ready at the Boston meeting and the committee was continued. During the year it concluded its labor, printed its report, and copies were distributed among members by Secretary Pennington, with the request that its provisions be carefully studied with a view to discussing them at this year's meeting, when the report will come up for adoption.

The local street-railway companies were represented at the meetings and in the conferences upon the arrangements for the convention and exhibition. On Monday evening the visitors were entertained by representatives of the local companies at a dinner at the Union club, a fashionable North Side organization. After dinner they visited Powers' Theater and saw William H. Crane in "The Head of the Family." On Tuesday, at the completion of the business session, the committee was entertained by John M. Roach, who took the visitors over the West Chicago Street Railroad system in his private car. Luncheon was served in the car and an opportunity was afforded the visitors to examine the Western avenue power station and other plants of the Yerkes system.

The decision to hold the meeting in Chicago will be enthusiastically received by the manufacturing interests. The first application for space was filed by Maurice Coster of Chicago, representing the Westinghouse Electric and Manufacturing company.

An organization of the local street-railway interests was effected immediately upon the announcement of the decision of the executive committee. George A. Yuille, second vice-president and assistant general manager of the West Chicago Street Railroad company, was selected as chairman of the temporary organization. Another meeting will be held soon to select members of local committees and take up the work of preparation for the October gathering.

Governor Tanner Wants Lower Fares.

Discussing street-railway legislation in the state of Illinois, Governor Tanner said recently to a reporter: "I believe in the idea of a supervising surface-line commission, which shall have the power of passing upon matters pertaining to city street-railway companies. But that commission should be the Railroad and Warehouse body. This is the proper body for overseeing and regulating all transportation companies as applies to city control of the corporation's franchises and rates of fare. The state commission, too, would not be subject to the annual or biennial changes which a local body would suffer. I shall consider no bill which does not provide for reduced rates of fare. In fact, I shall sign no bill which does not make this concession to the traveling public."

Submarine Telegraphy.

By DR. A. E. KENNELLY.

The history of submarine-cable telegraphy is replete with interest, not only to the student of electromagnetics, but also to the student of sociology. Its annals indicate the immense amount of labor which has had to be expended by a large number of men in the best years of their lives' work, in developing conjointly the knowledge and experience which now enable us to set geographical time and space at defiance.

Practically all of this work has been accomplished during the latter half of the century which is now about to close. The first submarine cable was stretched timidly across the Straits of Dover about the year 1850. It consisted of but a single copper wire, insulated with gutta-percha. It had no mechanical protection of any kind. Although the cable lasted but a few hours, being destroyed either by the violence of the elements or the hook of an unkind fisherman, nevertheless it demonstrated its electrical capabilities, and paved the way for greater successes in the years to come.

It was not long before shallow-water cables spread themselves around the shores of the Mediterranean, and in 1859 the first cable bridged the depths of the Atlantic. This was, indeed, a triumph of electrical engineering at that time, but the triumph was short-lived, since the cable died a natural death in a few weeks' time. It was replaced, however, by a far better cable in 1866, the experience of the earlier trial having come to fruition, and since that time Europe and America have never been beyond speaking distance.

At the present time there are some 150,000 miles of cable laid throughout the world, and a fleet of more than 30 telegraph ships is employed to minister to their needs. Although this length of cable would be sufficient to girdle the earth some six times, yet the actual girdle is incomplete at present at the Pacific Ocean, but it is now confidently expected that ere long this gap will be completed by a cable from the western coast of America to China or Japan.

The amount of the capital which has been expended in the enterprise of cable laying will be evident from the fact that cable costs, roughly, about \$1,000 per mile.

Enormous improvements have taken place in the speed of signaling or telegraphing through cables since the ocean was first spanned, a great deal in this direction being due to the inventive skill of Lord Kelvin. The mirror-galvanometer instrument, which is so valuable an adjunct in the electrical laboratory, has been yet more valuable to the electrical fraternity in the operating room, as a commercial signaling instrument, while the siphon recorder of later date has caught the fitful flickerings of the beams of light, and has left their record traced upon a moving band of paper.

There is no difficulty in laying a cable anywhere, but there is a considerable difficulty in laying a cable in such a manner as to minimize the risk of its fracture after being laid. It is a matter of experience that wherever a cable rests upon a rock it will break, and its rupture is only a question of attrition and time. Those who build upon rock, so far as cables are concerned, build to their destruction, while only those who build upon sand can expect dividends. The course on which a cable is to be laid should be thoroughly investigated beforehand by a ship which makes a zig-zag path over the course and sounds at frequent intervals, so as to insure the provision of a smooth and soft bed on which the cable shall be laid to rest, otherwise its slumbers will be interrupted by the rude shocks of rupture.

The size of a cable, and therefore, to some extent, its cost per mile, varies with the depth of water and the nature of the bottom. In deep water a cable is made slender and light; in shallow water it is made of relatively great weight and diameter, with large protecting steel wires to resist attrition.

The speed of signaling does not become any serious consideration until a cable is several hundreds of miles in length. In other words, rapid speed of hand signaling can be obtained over almost any kind of practical submarine cable up to a length of several hundred miles, but after a length of, say, 500 miles has been passed, it is necessary to employ delicate apparatus, and with long cables it is necessary to employ a comparatively large size of copper wire or strand conductor and insulating gutta-percha envelope.

There is scarcely any series of engineering operations which has a greater fascination or possesses more romantic interest than submarine telegraphy, in the picking up or repairing of cables. It is governed largely by time and tide and weather, and its fortunes are governed by a great variety of circumstances; nevertheless, cables have been successfully repaired in the deepest water to which they have yet been committed. The expense of repairs in deep water, say in two miles of water, is naturally much greater, as a rule, than the expense of repairs effected in shallow water, while in some cases very shallow-water repairs may be effected in a small boat or sailing yacht, at an expense that is relatively trivial.

1. Abstract of lectures delivered before the Department of Electrical Engineering, McGill University, Montreal.

Operation of the Storage-battery Road

An increase in receipts of 56 per cent. is shown by the annual report of the Chicago Electric Traction company for 1898, as compared with 1897. This is the company that operates the Englewood and Chicago storage-battery road, and the directors are much encouraged. A 16-mile single-track extension from Blue Island to Harvey will be built in the spring and also about two miles of extensions and connecting lines on the north end of the track system. No addition to the power-house equipment will be needed, but Manager Gilbert will require about 10 new open cars, with trucks arranged for storage-battery operation.

Some interesting figures are included in the report. The receipts per car-day were \$16.82; expense per car-day, \$14.64; receipts per car-mile, 10 cents; expense per car-mile, 8.7 cents. The power-house record shows a total of 1,227,228 kilowatt-hours and a total operating and maintenance cost per kilowatt-hour of \$0.0097.

The cost of operating and maintaining the batteries was \$4,624.82. The number of car-miles run was 609,767, so that the battery expense per car-mile was \$0.00758. This battery expense was a trifle less than nine per cent. of the total cost of operating and maintaining the road.

The experience of the company shows that the average mileage for each car-battery of 72 cells is 23,000 miles. When the limit is reached the positive plates only need to be renewed, as the test of service shows that one set of negative plates will outlast three sets of positive plates. With new batteries the cars are run 22 miles on one charge, but after the cells have been in use a short time the battery is changed both on the up and down trips, making the run 11 miles for one charge. However, the cars have made as high as 40 miles on one battery charge. The schedule speed, including stops, is 12 miles an hour, but the cars are capable of a speed of 30 miles an hour.

During January the record shows 1.65 kilowatt-hours at the power-house switchboard for each car-mile of service. This is about the average for the year.

The officers of the company are: President, Isaac L. Rice, New York; vice-president, Samuel Shipley, Philadelphia; treasurer, J. S. Bache, New York; secretary, E. R. Gilbert, Chicago.

Pacific Cable Project.

In a recent interview in San Francisco, John A. Strymser, president of the Pacific Cable company, is reported to have expressed himself as encouraged to hope that the cable will be maintained and operated by the United States government. He is of the opinion that private capital will not take the risk of governmental control.

Mr. Strymser is also of the opinion that no American cable can land in the Philippines or on the Asiatic coast without the consent of English companies, some of which run until 1904. These are vested rights, and Mr. Strymser thinks the United States government cannot abrogate the contracts without paying heavy compensation therefor, and that the only way for the American cable to gain access to Asiatic territory will be through the liberal backing of the United States government. Such a cable is a military necessity, and the United States should have absolute control and be independent of foreign companies.

The Japanese government, Mr. Strymser says, is willing to go into the proposition, under certain conditions regarding the cost of such a cable. Mr. Strymser said that \$20,000,000 would not cover the cost, for the reason that a duplicate cable must be laid; that if only one cable is laid it would surely go wrong at some period, and that the duplicate cable would then come in for use. Such a cable would require a reserve fund of \$300,000 a year for a renewal of the cable, twenty years being the average life of such a cable.

Four Notable Issues.

[From the *Southern Industrial and Electrician*, 1898.]

With the early January editions of the *Practitioner* of Chattanooga, the *Age of Steel* of St. Louis, the *Manufacturers' Record* of Baltimore and the *WESTERN ELECTRICIAN* of Chicago before us, we are so completely overwhelmed with valuable information and statistics concerning almost every branch of southern industry, especially with reference to the achievements of 1898, that we cannot begin to give our readers the benefit of it, for it would take every page of our regular edition of 1899 to begin to cover the ground. We desire, however, to give testimony to the value of these great journals, which deal with the commercial and industrial side of the almost entirely.

Measures and Men.

From the *New York Sun*.

A bill to cut the claws of monopoly has been introduced in the Illinois House of Representatives. It provides that "cities may acquire, construct, own and operate all public utilities such as street-car, telephone and telegraph lines, gas plants and electric-light plants." The Hon. Carter Harrison introduced the bill, and it will probably be put into the next platform of the Chicago Democracy. Statesmen like the Hon. Bath House John and the Hon. Hinky Dink look forward hopefully to the task of operating public utilities.

DEVELOPMENT OF THE TELEPHONE FIELD.

Self-restoring Drops.¹

By HERBERT LAWS WEBB.

The British Postoffice system, which is fully described in Preece and Stubbs' "Manual of Telephony," has never been adopted in this country, and the first application of automatic work in American practice was made at the exchange end of the system. By the use of what is generally called a self-restoring drop, steps 4 and 11 in the original series of operations are got rid of, step 4 being accomplished by step 3, and step 11 by either step 9 or 10. Self-restoring drops are either mechanically or electrically operated. In mechanically operated self-restoring drops the line drop is so placed that the shutter falls over the aperture of the answering jack, and the plug, in entering the jack, pushes back the shutter, which engages with the armature lever and is held in position to be released by the next call. A clearing-out drop is made mechanically self-restoring by placing it in such a position that the connecting plug on falling back into its socket on the cord-shelf actuates a lever that resets the shutter of the drop. Both of these are simple and ingenious devices.

Electrical self-restoring drops are quite another matter, and achieve various results that are not attained by mechanically restored drops. The self-restoring drop is an essential part of what is generally known as the "bridging" board, in which the spring jacks are connected in multiple instead of in series, as in the older forms of multiple board. In the chapter on multiple switchboards it was explained that the number of contacts in a large switchboard and the "open leg" formed by the test wire were serious disadvantages. In the bridging board the circuit is continuous throughout the board without contacts at the jacks; the test wire is an entirely separate circuit from the talking circuit, and the battery which furnishes the test energizes at the same time the magnet of the restoring coil of the drop. The result of this arrangement of circuits is a complete cure of the electrical difficulties in the series board arising from the numerous

New England Telephone News.

[From the Boston correspondent of the WESTERN ELECTRICIAN.]

A new telephone company has been organized in Lynn by local capitalists, and 110 subscribers are now said to be awaiting instruments. Six prominent business men have subscribed \$15,000 toward the enterprise, and are said to be ready to join with others to increase the amount. They are awaiting the laying of wires and placing of instruments by the big Boston telephone concern, recently incorporated as the Massachusetts Telephone company, and will probably co-operate with the new concern.

President Glidden of the Michigan Telephone company has returned to Lowell with his associates, after spending two weeks in the territory of his latest acquisition. During his trip President Glidden says that all the principal exchanges were visited and the long-distance routes inspected, and it was determined to recommend the construction of 1,500 miles of long-distance pole lines and 20,000 miles of copper wire. Mr. Glidden says:

The press of Michigan received with great favor the proposed extensions of the long-distance system throughout the state. The telephone business in Michigan is 100 per cent. under the Pacific coast development. General Sabin of San Francisco has kindly loaned the Michigan company his chief contract agent, Mr. Charles E. Nestor, who during the last three weeks has been inaugurating a system of canvass in the northwestern territory of the Erie, where he has secured in Minneapolis and St. Paul alone 500 subscribers. General Sabin was informed of Mr. Nestor's success and replied: "You have Nestor, but we have his methods; thirty new contracts in San Francisco yesterday, and still the growth of the Pacific goes on, notwithstanding it is already double that of all companies except the Erie." Mr. Nestor will shake up Detroit, which now has 5,000 subscribers. Mr. Nestor will not leave the field until he has raised the number to 12,000.

The instrument statement of the American Bell Telephone company for the month ended January 20th breaks the record once more. The business for December was the heaviest previously recorded, with a net output of 27,771 instruments, but the latest record breaker shows a net output of 31,829. Following is the summary, with comparisons.

Month ended January 20.	1899.	1898.	1897.
Gross output.....	46,548	25,861	14,437
Returned.....	14,719	10,041	6,401
Net output.....	31,829	15,820	8,036
Total outstanding.....	1,157,075	938,073	781,835

At the annual meeting of the Southern New England Telephone company on January 31st, the report submitted showed gross earnings of \$644,003, expenses amounting to \$491,475, dividends paid to the amount of \$150,660, and a surplus of \$1,868. There was an increase for the year of 1,213 stations, and all but 14 towns, out of a total of 168 in Connecticut are now reached by the company, which has an aggregate of 10,588 stations. During the year just closed about \$90,000 was spent on underground work, it was stated. Nearly all of the old five per cent. bonds of the company, overdue, on which the company held an option at 103, have been refunded into new five per cent. bonds for a long period.

Proposed Legislation.

In the Illinois Legislature last week, Representative James Hackett of the First district introduced a low-rate "common-carrier" telephone bill, and he claims that the retail druggists of Chicago are ready to indorse the measure. The bill, which was introduced in the Senate also, by Senator Daniel Curley of the Fourth district, declares that all telephone lines in the state are common carriers, and compels a telephone company to permit a competing line to make connections with its whole system. The bill fixes the maximum rate for the rent of a telephone in Chicago at five dollars a month for business and two dollars a month for resident service.

In the New York Legislature Senator Marshall has introduced a bill reducing telephone rates in all parts of the state. It provides that six months after passage, unless companies can show to officers that rates are inadequate, the rates shall be in cities of 1,000,000 and over not more than \$125 yearly; in cities of less than 1,000,000 and over 500,000, \$85; in cities of less than 500,000 and more than 100,000, \$48; in cities of less than 100,000 and more than 20,000, \$36; in cities of less than 20,000 and more than 8,000, \$30; in cities of less than 8,000, \$27. These figures are to be based on the census of 1890. Charges at pay stations are not to exceed 10 cents for five minutes and five cents for each additional five minutes. No yearly subscriber shall have to pay at a pay station unless sending in excess of 50 messages a year. A card is to be issued for him and his employes for business purposes.

Telephone Strike Averted.

The staff of telephone operators employed in the exchange of a large telephone company came very nearly declaring a strike recently, according to the local correspondent of the WESTERN ELECTRICIAN. The trouble was caused by a rumor that the manager was to be asked to retire in order that a former manager might be reinstated. In that case the girls concluded that the chief operator would also be asked to resign and that a former chief operator, who was not too popular, would take her place. The 36 oldest operators were appointed a committee to prepare an ultimatum for the officers of the company, and they did not shirk their duty even if their jobs were at stake. They told the directors that if the

present manager was asked to resign a wholesale bunch of resignations would accompany his. The committee then presented a petition, setting forth their views, signed by every operator except one, who happened to be related to the former manager. The directors told the committee that perhaps such a change was not anticipated. But that was not an acceptable answer.

"Unless we are assured that the present manager will remain," said one of the girls, "before two o'clock, we will give the signal."

The signal was to be four rings of the big bell in the office. Before the hour specified the officers had returned a favorable answer, and the threatened strike was averted. A collection was taken up, amounting to \$15, and a beautiful floral piece, consisting mainly of American Beauty roses, was presented to the manager. During the presentation business was suspended.

Result of Competition.

The Michigan Telephone company is making determined efforts to regain its prestige in Detroit and throughout the state, and the advertising columns of the newspapers are freely used. One of these display advertisements is reproduced herewith from a Detroit paper, and it plainly indicates the desperate character of the struggle that is now occupying telephone men in that section. Another conspicuous announcement, which appeared in last Sunday's Detroit papers, occupied a half-page and contained a diagram showing the long-distance connections which the company "pledged" itself to establish as well as those in operation to-day.

The corporation claims to be "one of the largest



Michigan Telephone Company
FREE RENTAL

You can have a Long Distance Telephone (latest pattern) at your home for five cents per day.
For Particulars call MICHIGAN TELEPHONE 189.

RESULT OF COMPETITION.

home industries of Michigan," and appeals to the people of the state for patronage and support on this account. If this claim has no more foundation than some others made by the company, it cannot have much effect upon the community. One of its claims is worth repeating here:

A large majority of its stockholders have been and are still residents of the state; probably more than a controlling interest in its securities are held in the state.

This will be news indeed to well-informed telephone men and to the stockholders themselves, as it has not been generally understood that the Lowell capitalists represented by Mr. Glidden had acquired legal residence in Michigan. The only other explanation that suggests itself is that "probably more than a controlling interest in its securities are held in the state" as collateral.

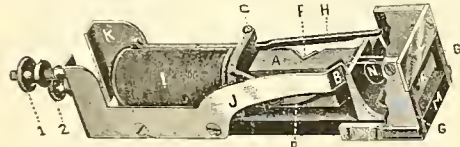
NEW COMPANIES.

The Edmonds Co-operative company has been incorporated at Edmonds, Wash., with a capital stock of \$10,000, to construct a telephone line from Edmonds to Seattle.

The People's Telephone company of New Orleans, capital \$600,000, has elected W. L. Holmes of Detroit, Mich., president; P. Curtis, general manager; H. P. Walmsley, treasurer, and H. C. Gage, secretary.

The Little Valley Telephone company, to operate a telephone system in Cattaraugus County, New York, has been incorporated at Albany with a capital of \$500. The directors are S. W. Bedient, S. S. Bedient, F. G. Barnes, W. C. Parker, H. J. Crissey, T. Champlin and M. J. Rich.

The Tradesman reports the following named newcomers in the telephone field: Long-distance Telegraph and Telephone company of Texas, or-



A jack, JK line springs, B contact for sleeve of plug, F contact for tip of plug, N opening of jack, entering which plug restores drop shutter E. I line drop coil, D spring normally in contact with J, which cuts out coil when plug is inserted, breaking contact between J and D; H armature, pivoted at C. Drop E engages with tip of H when drops in normal position. 1 and 2 are binding screws for holding jack and drop in position on the framework of the board.

SELF-RESTORING DROPS.—COMBINED JACK AND SELF-RESTORING DROP.

contacts at the jacks and from the unbalancing effect of the test-wire. The electrical self-restoring drop consists of two electromagnets; one of these responds to the current sent over the subscriber's line, and the other is included in the test circuit—which is closed as soon as a plug is inserted in the answering jack—and attracts and holds the shutter let fall by the action of the line magnet. The clearing-out drop is of the same pattern, the restoring magnet being energized by a battery brought into play by an extra contact on the listening key. The electrical self-restoring drops, not requiring to be touched after having been properly adjusted, are placed in the upper part of the switchboard, thus leaving the lower part free for jacks. The result is to make the working part of the board more compact and the jacks more accessible to the operators. This is an advantage not gained by the use of mechanically restored drops, which have to be in a position to be operated by the movements of the plugs.

In the cut is shown a combined spring-jack and self-restoring drop, designed and manufactured by the Western Telephone Construction company of Chicago. When the drop is operated the shutter falls in front of the opening through which the plug must enter the jack. On inserting the plug the shutter is pushed upward and engages with the tip of the armature lever H, which holds it in position. The plug, entering the jack at N, goes home and makes contact with sleeve at B and tip at F, cutting out the drop by pressing J outward, and so breaking the contact between D, connected to the coil, and J, the line spring. This arrangement is simple and compact. It can easily be removed for repairs by loosening the nuts at 1 and 2. One hundred complete jacks and drops can be placed in a space 13 1/2 inches by 16 inches.

Other types of mechanically self-restoring line drops necessarily employ the feature of replacement of the drop shutter by the plug. In some types the drop coil is not cut out and the plug and shutter are so arranged that the shutter is free to be thrown again while the plug is in the jack. The line drop then serves also as a clearing-out drop, and when the plug is withdrawn in response to a clearing-out word it again trips the shutter and restores it to its normal position.

¹ Adapted from new edition of "Telephone Handbook" (Edited by P. H. R. Co. Inc. New York, 1898), now in press.

ganized by C. H. Brown of Waco and others; Monroe and Charlotte (N. C.) Telephone company, William S. Lee and others; Independent Telephone company of Austin, Texas, J. B. Earl and others; People's Telephone company of Dillon, S. C., E. L. Moore and others; Electrical Construction company of Waco, Texas, S. Sawyer and others; Florence (S. C.) and Allison Telephone company, R. C. Commander and others.

TELEPHONY ABROAD.

A trunk telephone line has been opened between Paris and Brest, and it will probably be extended to Cherbourg. A line to Luxembourg, via Longwy and Nancy, is projected.

President Forbes of the National Telephone company of England reiterates the statement that the inefficiency of the company's service is due to the policy of the government, which has hampered the corporation's efforts to improve and extend the system. In a communication to the *London Times*, President Forbes signifies his willingness to co-operate in every way toward securing better service, even to the extent of giving the government control of the plant. He says that the management is and has always been "only too anxious to co-operate with the Postoffice in effecting improvements and development in the business; and if, as it seems to be possible, the drift of public opinion should result in the desire to transfer the telephone business to the state, it would feel it to be its duty, upon reasonable and fair terms, loyally to co-operate in bringing about the change."

In connection with the present French telephone service it is contemplated to establish a system by means of which any subscriber or non-subscriber will be enabled to make an appointment with any other individual (who need not be a telephone subscriber), to be in attendance at the latter's instrument or at a call office at a stated time. These appointment messages will be transmitted for five cents within a distance of 15 miles, and for greater distances a higher charge will be made, but not exceeding 10 cents. The message making the appointment will be delivered at the recipient's house, just as a telegram. A similar system for English trunk service was suggested by Campbell Swinton in the discussion on Mr. Gavey's telephone paper at the Institution in 1896.

London telephone service is still under consideration of the London County Council. The highways committee reports having had under consideration a letter from the city corporation, forwarding a resolution to the effect that application be made for a license to establish a telephone service in conjunction with the London County Council and other local authorities within the London telephone area. The corporation asked the council to appoint six representatives to attend a conference at the Guildhall to consider the subject, and, if possible, to make the necessary arrangements. The highways committee recommended and it was determined to appoint representatives to be present at the conference.

The London County Council a year ago accepted an offer of the Postoffice to provide plug-holes for portable telephones on fire-alarm posts, with a view to enabling the apparatus to be utilized by firemen for the transmission of telephonic messages, but judging from the statements of the *London Electrical Engineer*, little actual progress has been made in taking advantage of this innovation. The chief officer of the fire brigade has obtained provisional protection for an improved appliance, and the apparatus has for some months been tried, with very satisfactory results, with a fire-alarm connected with the chief station. The officials of the Postoffice are also quite satisfied with the result of the experiments, and the chief officer now suggests that an extended trial should be made with the fire alarms connected with 10 stations. The number of fire alarms connected or ordered to be connected with the 10 stations in question is 166, but it is thought that five portable telephones per station will be sufficient. The committee recommends that the council should accept the offer of the Postoffice to fit fire-alarm posts with microphones and plug-holes for telephones, and to provide plug-holes in the corresponding indicators in the fire stations, for an annual rent of £31 15s. per 50 posts; that, in the first instance, the acceptance be limited to fire alarms in connection with the chief station and the Hampstead, Hammersmith, Holloway, Hackney, Stoke Newington, Shooter's Hill, Lewisham, Wandsworth and Tooting stations. The council will purchase the portable telephones direct.

Public interest in the telephone question in England is sufficiently pronounced to secure publication in the *Fortnightly Review* of an article by Mr. A. H. Hastie, entitled "The Telephone Tangle and the Way to Untie It." The writer displays a personal leaning toward the National company. Mr. Hastie is not favorably disposed toward the Postoffice, and he wants the telephone service to be placed under a separate and independent department whose duty it will be, among other things, to enable any gentleman shooting in the north of Scotland to have his London letters read out to him every morning, via the trunk telephone wires. This feature of Mr. Hastie's "ideal system" does not commend itself to the average English "sporting gentleman, nor of a vast number of other persons who desire to be let alone in their privacy and their recreation." This is a characteristic English view of the subject.

First Result of Competition in Chicago.

In spite of their public declarations that competition in telephone service in Chicago would be impracticable, the officers of the Chicago Telephone company have given unmistakable evidence of their interest in the proposition of the Illinois Telephone and Telegraph company to establish a rival exchange system in this city. As a result of the threatened competition the company is proposing a readjustment of rates and basis of compensation to the city, with an extension of the free telephone service to many departments of the city government and greatly reduced rates for others. Even under the present conditions, however, the company cannot bring itself to make a voluntary concession gracefully, and it makes a condition of the granting of the concessions mentioned the extension of the life of its franchise 20 years, giving it 30 years to enjoy the privileges ensured under it.

At the meeting of the City Council on Monday evening, the extension ordinance of the Chicago Telephone company was presented and referred to a committee, and the amended ordinance of the Illinois Telephone and Telegraph company was favorably reported by the committee, and under the rules action was postponed until next week. Consideration of these ordinances was the principal feature of the evening's session.

The principal features of the old company's proposed franchise may be summarized as follows:

Extends the original 20-year franchise granted to the company on January 4, 1889, for 20 years, making it expire in 1909.

Offers the city \$50,000 a year cash compensation, payable in quarterly installments, in lieu of the 3 per cent. of gross receipts provided for in its present ordinance, which, however, amounted to \$50,000 last year.

Increases the number of free telephones furnished to the city, so that the value under the present rates would aggregate \$15,000 a year instead of \$2,000, as at present.

Allows the city free use of the company's telephone poles and increases the amount of space allowed the city to its conduits by 25 per cent.

Makes reduction in telephone rates to small users according to the following schedule: Forty dollars a year, four parties on a line, with 400 calls, residence only; 50 a year, two parties on a line, with 600 calls, residence and business use; 90 a year for special line, with 900 calls, residence and business use. Additional calls at graded rates in proportion to number used, reaching as low as three cents a call for largest number.

As amended the ordinance of the Illinois company meets the criticism expressed by the mayor on the original franchise which he vetoed. The life of the franchise is cut down from 50 to 35 years, a compromise between the company's petition and the mayor's standard, and compensation for the city is provided in the following manner:

After 15 years the company shall pay the city for 10 years 3 per cent. of its gross receipts; then, for five years it shall pay 5 per cent., and for the remaining five years 7 per cent.

Commenting upon the movement for independent service and the action of the old corporation, Mayor Harrison is reported to have said:

It shows at least what competition will do. How much of a reduction in rates it offers I cannot say, as I have not had a chance to look into that phase of the matter, but if the mere introduction of a rival ordinance will cause even this concession from the present company, the question arises, what would the passage of such an ordinance do?

The Illinois company's ordinance as amended seems to be a fair proposition, and even allowing, after it has been established, that one company only lives and the other has to go to the wall, rates will come down at least during the telephone war, and when they are once down they can never be put up again.

President Clark of the Chicago Telephone company is quoted in an interview as follows:

It not only gives the city more compensation than it received under the present franchise, but it allows for much cheaper telephones for a considerable number of users. There is a large number of people who want a telephone for occasional use, but do not use it constantly, as does the large business man. They would be glad to put in instruments could they be furnished them at a price commensurate with the service rendered, and that is what this ordinance proposes to do. It will allow the person having only occasional use for a telephone to put one in at a less price than the man who uses his constantly.

It will be noticed that no provision is made for a lower rate for general telephone service. The changes proposed would really benefit the company, as it would increase the "residence" lists materially, which to-day is the weakest point in the service, and it would strengthen the company with merchants, as the latter would find the telephone a necessary adjunct to their business.

Telephone Patent Litigation.

Judge Allen, at Springfield, Ill., on February 4th, announced his decision in the three suits of the Western Electric company against the Citizens' Mutual Telephone company of Decatur, Ill., in favor of complainant. The inventions involved were controlled by the following-named patents:

No. 202,495, granted April 16, 1878, to Thomas A. Watson, for Improvements in Electric Telegraphy or Telephone Call Signal Apparatus.

No. 303,774, granted August 10, 1884, to Horace H. Eldred, assignor to Western Electric company, for Improvements in Telephone Exchange System and Apparatus.

No. 320,058, granted November 10, 1885, to Charles E. Scribner, assignor to Western Electric company, for Improvements in Operator's Apparatus for Telephone Exchanges.

These suits were commenced in 1894, and arguments on final hearing were had in May, 1897.

Since the Watson patent No. 202,495 has expired, complainant is entitled to an accounting only on that invention. In case of the Eldred patent and the Scribner patent, complainant received an injunction as well as an accounting. Claims 1, 2 and 16 only of the Eldred patent were involved.

Fair Dealing Demanded.

(From the Chicago Tribune.)

Ten years ago the council granted the Chicago Telephone company the right to construct and operate its line for a period of 20 years. The company agreed to pay the city three per cent. of its gross earnings and to furnish it a certain number of telephones free of charge. Although the old grant has 10 years yet to run, the company has applied to the council for a new grant running 20 years from date. In return it proposes to give the city \$50,000 a year instead of three per cent. of the gross earnings to give it the free use of telephone conduits and poles, which, it estimates, will be worth nearly \$50,000 a year to the city, and to reduce telephone rates to meet the needs of small users.

Should the city accept this proposition, or should it demand greater compensation from a corporation which could not carry on its business if not allowed the use of city streets and alley to build conduits for its wires or erect poles to run them on? The corporation in question is no small, struggling concern. Its gross earnings last year were two millions. Its net earnings were \$600,000. It was able to pay 12 per cent. dividends to stockholders and carry over \$100,000 to surplus account. The gross earnings having been two millions, it paid the city about \$60,000. This fact is not brought out clearly in the company's statement, which is that "payments have averaged about \$33,000 a year." They fell below that figure in 1890. They were much above it in 1898. The statement of the company, in view of these facts, is not candid or complete.

The city is asked to accept \$50,000 instead of a percentage which amounts now to \$60,000. That would be progressing backward. The company has dealt disingenuously with the council and the public in seeking to hide the fact that it is asking the city to surrender \$10,000 and more a year. It prejudices its case seriously when it sets out with a misleading statement. A corporation which thinks it worth while to ask for privileges of special and peculiar value at the moment when it sees itself threatened by competition should hold back no facts and should suppress nothing.

Let the telephone company pay the city 10 per cent. of its gross earnings for the next 20 years as an equivalent for the use of the streets and alleys, without which it could not do business. Then \$200,000 a year will go into the city treasury to begin with. A small fraction of that sum will be used to pay for telephone service the city now gets free. The remainder will be expended for public purposes. But it may be argued that if the city, instead of surrendering its three per cent., demands 10 per cent., the company cannot or will not make the proposed reduction in rates. That reduction will benefit some careful, economical telephone users. It will not necessarily reduce materially the gross earnings of the company. The city cannot, however, in justice to all its citizens, accept inadequate compensation for privileges granted in order that a few men may get the use of telephones on better terms. If the company charges too much the Legislature should regulate and reduce charges which are notoriously too high.

The ordinance which the telephone company has presented should not pass. If it will not pay 10 per cent. let the city insist on its three per cent. until 1909. Then it can demand and will get that larger proportion of the gross earnings it should receive. The company is anxious to get an extension. It fears competition. Then let it come forward prepared to deal honestly and fairly with the city. When it does that it will be met in a spirit of fairness and moderation.

EXTENSIONS AND IMPROVEMENTS.

Williams, Ariz., will soon have a telephone system.

The Sunset Telephone company is at work putting in suburban telephone at ranchers' homes near Redondo, Cal.

The Twin City Telephone company of Benton Harbor, Mich., has increased its capitalization from \$25,000 to \$50,000.

The Oregon Telephone and Telegraph company is putting up a new telephone line between Portland and Astoria, Ore. The distance is 110 miles.

The Seattle (Wash.) *Times* announces that arrangements have been perfected to extend the telephone system from Snohomish to Monroe, a distance of seven miles.

A franchise has been granted to the Spirit Lake Transportation and Improvement company to construct a telephone line along the public highway from Rathdrum, Idaho, to Spirit Lake.

The stranded Red Star Line ocean steamer Rhyndland, off Lewes, Delaware, has been connected by telephone with the company's offices in New York through the government coast line, and the operations have been directed from headquarters.

Frank Cole of Grass Valley, Cal., announces that he will build a telephone line in the spring from the Mountain House, which he is conducting, to Forest City. As soon as weather is favorable the Sunset Telephone company will send a man from San Francisco to look over the route from Grass Valley to Moore's Flat, and if the line is built Dr. Brooks of Forest City will have a line constructed from that place to Downville.

New General Electric Motor.

To meet a demand for larger direct-current stationary motors as compact and efficient as motors of the type "C. A.," which range from one-eighth horse power to two horse power, the General Electric company has perfected a line of motors known as the type "C. E." These embody all the features of excellence characteristic of other General Electric motors, as well as the latest ideas in motor construction, and the design is such that it may readily be modified to meet special requirements.

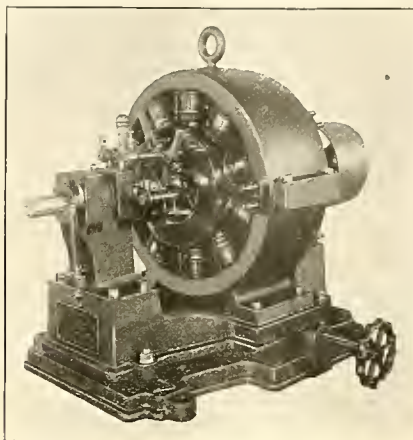
The motor frame, which is also the magnet yoke, is of soft steel of high permeability. It is cast in the form of a hollow cylinder, with projecting feet on the outside and seats for the pole-pieces on the inside. The short magnetic circuit which this arrangement gives and the use of the best material contribute to make the new motor efficient in all its capacities. To obviate eddy-current losses, the pole-pieces are built up of iron laminations and are secured to the yoke by through bolts with nuts on the outside. The field coils are held in place by the extended lips of the pole-pieces, and as the face of the pole-pieces covers a large surface of the armature without increasing the size of the field coils, the efficiency of the motor is materially augmented.

The armature is built up of iron laminations assembled directly on the shaft. To prevent eddy currents, each sheet is japped on both sides, and good ventilation to core and winding is provided by air ducts. The laminations are clamped solidly between two cast-iron spiders, extended at each end as flanges to support the coils.

The armature coils of copper wire, form-wound, insulated and tested, are placed in the core slots, the ends of the coils lying along the flanges. This arrangement constitutes the "cylindrical" armature winding. As it provides a large ventilating surface for the conductors and reduces the length of wire necessary with consequent decreased resistance, it conduces to cool running and high efficiency, as well as to ease of removal and replacement of any coil. The insulation employed is that used with all General Electric railway motors, and is tough, impervious to moisture and practically indestructible. The coils are securely held in a rigid position, and injury to the insulation from sliding or vibration is impossible.

The commutator and brush-holders are of the types used with the company's railway motors. The armature leads are soldered into slots in the segments, and, being short, are not liable to become displaced and, by abrading the insulation, cause a short-circuit. The brush-holders are of cast-brass, arranged for radial carbon brushes, which slide in finished ways and are pressed against the commutator by independent pressure fingers, giving uniform pressure throughout the life of the brush. There is no sparking, and change from no load to full load requires no shifting of the brushes. The

and more expensive machine to give the same output. The most economical speed for a given duty is determined by a careful consideration of the relative advantages to be derived from a slow speed and the increase in cost required to obtain it. In the motors under consideration the four-pole construction has been adopted for all sizes down to and including the three horse power, slow-speed motor. By the adoption of this construction, the use of a steel magnet yoke and the use of end shields to support the bearings, an economy of material is effected which permits, without sacrifice of strength or stability, of the construction of mo-



LA ROCHE IDEAL ALTERNATOR.

tors much lighter for a given output than other machines running at even higher speeds. The magnetic material is economically arranged; the machines are light and compact; the center of gravity is low and the floor space occupied small.

The "C. E." motors are built in capacities of from two horse power to 10 horse power in slow speeds, and from three horse power to 15 horse power in moderate speeds. They are conservatively rated, and will run under full load at an unusually low temperature. It is said that the standard type will deliver the rated output continuously without rising in temperature above 40° C. above the surrounding air. With the wire screens over the hand-holes this will be slightly exceeded. The motors will carry a temporary overload of 40 per cent. without injurious heating. Following its usual practice, the General Electric company makes all parts of these motors to gauge, and duplicate parts can thus be obtained without delay.

La Roche Ideal Alternator.

The illustration shows the Ideal alternator, which is manufactured in all sizes up to 150 kilowatts by F. A. La Roche & Co. of New York. This firm makes a specialty of building experimental alternators for colleges and scientific laboratories. These experi-

ment machines are generally of small size, and the following description of the five-kilowatt, three-phase alternator furnished to the Alabama Polytechnic Institute brings out the main features of the type. This alternator is designed to generate three-phase currents at 220 volts, and is therefore supplied with three collector rings, between any two of which it is possible to obtain a current of 13.3 amperes and 220 volts when the armature is revolved at a speed of 720 revolutions per minute. Two additional pulleys are provided, by means of which it is possible to drive the alternator at 600 revolutions per minute and 420 revolutions per minute, at which speeds 180 volts and 100 volts are obtained, the field excitation being maintained constant at 110 volts.

The bearings are of the self-oiling type, and the armature is so well balanced that there is no vibration, even, it is said, when the machine is driven at the speed of 2,500 revolutions per minute. For varying the degree of tension on the belt, a hand-wheel and belt tightener are provided on a special sub-base furnished with the machine.

The La Roche & Co. also build larger alternators for single, two or three-phase currents, and wind the armatures for any voltage up to 2,000 volts. The fields can be furnished either separately excited or provided with a composite winding; the latter is excited by a portion of the total armature current, which is rectified by passing through a special commutator. By this means the field excitation is increased as the load increases, and by making the proper adjustments any degree of compounding can be obtained.

New District Telegraph Company.

Some curiosity has been excited by the incorporation of the Illinois District Telegraph company of Chicago. The new company has a capital stock of \$100,000, and the incorporators are F. H. Tubbs, Edward M. Mulford, Jr., and William J. Lloyd. The gentlemen named are respectively district superintendent, local manager and assistant district superintendent of the Western Union company at Chicago. The Illinois District Telegraph company is licensed to give a district telegraph and messenger service. It is not believed that the Western Union Telegraph company itself has any intention of engaging in the district messenger business.

American Automobiles for Bombay.

Indian princes and European nobles are to be supplied with electric carriages made in Chicago, and it is but natural to assume that the example of these illustrious leaders of fashion will be faithfully followed by courtiers of less importance.

The American Electric Vehicle company, 1545 Michigan avenue, closed a contract last week to supply electric carriages for several Bombay princes. The orders aggregated \$26,000, and the vehicles will be shipped during the early summer.

The same company is also estimating the cost of

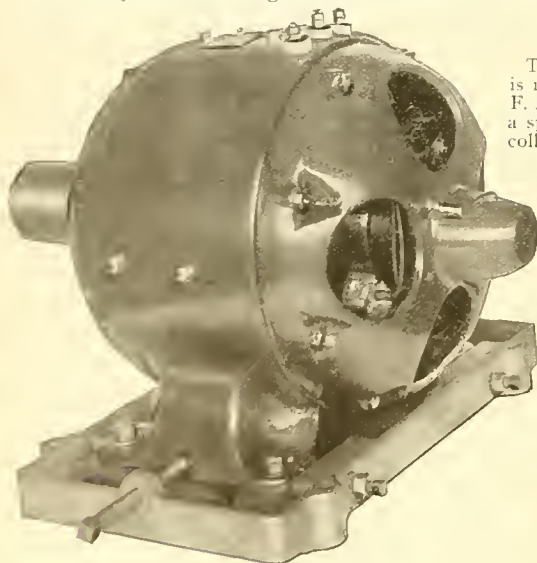


Fig. 1. Completed Motor.

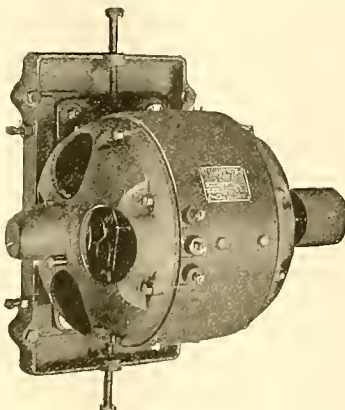


Fig. 2. Wall Suspension.
NEW GENERAL ELECTRIC MOTOR.



Fig. 3. Motor Armature.

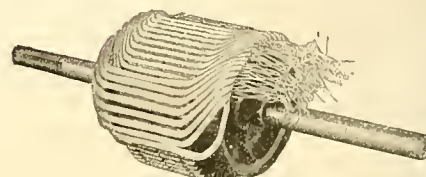


Fig. 4. Motor Armature without Coils.

ing wear on the commutator is that of friction, and the use of carbon brushes renders this negligible.

The bearings are supported by cast-iron end shields. This method of support is lighter, but not so rigid as pillow block, and, while affording protection to the working parts, does not lessen the compactness of the motor. Furthermore, the motor being symmetrical a simple quarter or half-turn of the end shields allow it to be fastened to a wall or to be suspended from the ceiling. The end shields have hand-holes, which provide ventilation and give easy access to the working part. In motors intended for use in dusty places, the hand-holes may be covered by wire screens, which offer little resistance to the air, and for continuous service are superior to solid covers.

Slow speed in motor means diminished belt wear and friction of belt, bearing and commutator, but a decrease in speed necessitates a corresponding decrease in output in motors of a given design a reduction in speed requires a heavier

mental machines are generally of small size, and the following description of the five-kilowatt, three-phase alternator furnished to the Alabama Polytechnic Institute brings out the main features of the type.

This alternator is designed to generate three-phase currents at 220 volts, and is therefore supplied with three collector rings, between any two of which it is possible to obtain a current of 13.3 amperes and 220 volts when the armature is revolved at a speed of 720 revolutions per minute. Two additional pulleys are provided, by means of which it is possible to drive the alternator at 600 revolutions per minute and 420 revolutions per minute, at which speeds 180 volts and 100 volts are obtained, the field excitation being maintained constant at 110 volts.

The field frame is an angle steel casting with 10 poles. The 10 field spools are connected in series, each having 410 turns of No. 14 B. & S. wire, requiring a field current of three amperes at 100 volts to excite the field at full load.

The armature, 16½ inches in diameter, is of the

a line of stage coaches for the Fifth avenue stage line of New York. The company operating the line has decided to adopt the automobile, and the equipment is to consist of 20 vehicles.

Chicago Electrical Association.

The spring programme of papers and meetings of the Chicago Electrical association contains the following announcements: February 17th, "Police and Fire-alarm Systems of Chicago" (illustrated with apparatus), Edward B. Ellicott; March 3d, "Patent Systems of the United States and Foreign System Compared," W. Clyde Jones; March 17th, "Electric Street Lighting of Yesterday and To-day," Albert Scheible; April 7th (subject to be announced), Charles A. Brown; April 21st, "The Adaptation of Electricity to Existing Steam Trunk Lines," W. D. Ray; May 5th, "The Electric Protection of Safes and Vaults," Clyde J. Coleman; May 19th, annual banquet.

The meetings are held at 1736 Monadnock building.

Education of Electrical Apprentices and Journeymen.

(Continued from page 81.)

ing into the world large numbers of young men, who, after years of work, take the title of "electrical engineer." How many of these will ever have an opportunity to do any genuine electrical engineering? How many of them are destined never to earn, in electrical engineering, a \$1,000 or so a year, the pay of a skilled mechanic?

For every single opening for an electrical engineer there are a hundred openings for the skilled journeyman, and for every successful engineer there are a hundred successful journeymen.

And to be a journeyman does not mean to be debarred from engineering.

Who have made the notable inventions? Who have carried out the greatest engineering problems? Not the trained engineers, but journeymen who have started at the bottom, and by their individual efforts raised themselves to the highest level. "By their deeds ye shall judge them" is true of men, whether they have been educated up to a high standard or not, and self-training is often the more effective.

The compensation for skilled electrical labor, such as journeymen bring into the market, has been on the increase; it will continue to increase, and in an unfair degree, unless those who are the employers think in time of a method of supplying the increasing demand, or of making the labor which is offered worth the increase in results achieved.

Every new electrical equipment, each railroad equipped electrically and each industry which depends on electricity is taking some of our skilled men from the open market and retaining them permanently, and confining their energy to maintaining such equipment.

Whence will come the men to replace these deflections? Has no one a solution to offer as to the best way of replenishing the supply?

Many methods of solving this problem have been tried, some of them without proper consideration of the case.

Some have been the education of journeymen in other trades, such as carpenters, draughtsmen, etc., by means of actual experience during their employers' time, a poor means at best, and which places the burden directly on the shoulders of the employers, while the resulting mechanic leaves much to be desired in all-around efficiency.

Oftentimes young men imbued with the desire to be electrical artisans attend, in a desultory fashion, popular lecture courses, witness a few experiments in static and galvanic electricity, and find them of such interest that, even though they possess little or no qualifications and have been educated and trained for other lines, they determine to make electricity their life work. Their methods of securing the necessary instruction is usually a so-called apprenticeship in a shop manufacturing some article, which in itself gives them comparatively little instruction, and which makes them eventually skilled in head work, without giving them any breadth of training, and merely enables them to fill the position of a slim automatic machine.

Sometimes they read electrical lectures and trade papers, in many instances finding themselves very much at sea because of the technical character of the papers and articles, which their previous training has done nothing to enable them to understand.

Sometimes, as a final resort, they become recipients of the training offered by correspondence schools, and these schools are certainly gathering an ever-increasing clientele, which their merit justifies.

In very many instances they attend by far the best and most modern form of securing this training, and that through the trade school. There are, however, such a very few of the latter institutions, in spite of their acknowledged merit, and they are so little known, that only a very small percentage of the number who wish to become electrical craftsmen can reap their benefits.

The superiority of the trade school for educating and equipping young men for trade work is so vastly superior to any other means of performing the same work that we must look to it in the future to solve this very serious problem. Foreign countries have realized this fact for many years and profited by it. Is it not time that this progressive country began to realize it also, and to stimulate and support such institutions? They certainly are bound to spring into existence, and those that exist and have an honorable record are bound to improve that record, and it is but a question of time when intelligent thinkers must give them their proper place and dues.

It has been my good fortune to have been connected with trade schools for some years, notably with the New York Trade School, St. George's Evening Trade School of New York and the Highland Falls Trade School of Highland Falls, New York. They have taught me that trade schools have an equally high aim and purpose as any educational institution in the country, and that the field which they cover cannot be covered in any other way, and if they were accorded the same support and encouragement that other educational institutions receive their effect and beneficial influence would be as widespread, if not felt in even a greater degree, because of the class which they aim to assist.

It seems strange to me that trade schools should be subject to such marked indifference by employers and by such intense persecution and criticism by the fraternity which they aim to assist merely because of the possible future competition their graduates will cause them when they have come to the journeymen's estate. Was there ever a scientific institution aiming at higher education, a medical college, a law or an art school, but received the support and indorsement of the leaders of the respective professions, if its object was not to make money, but to benefit the arts and sciences?

Are lawyers, physicians, artists and men of other professions less free from the thought of competition that the journeymen and the employer should be found wanting in that which tends to advance his profession?

The governing societies, the trade associations, the employers' associations must see the wisdom of the trade schools eventually, and when they realize the necessity for them, and are compelled to support them, then, indeed, will they see the error of their ways.

A society like the American Institute of Electrical Engineers, whose members comprise a very large number of the engineers engaged in electrical enterprises, can do much to bring this problem before the men of their line, and can materially assist in a solution of this problem, of so much importance to the welfare of the electrical industry. The youth of the country imbued with the desire to become electricians will force their way in, and the inevitable is bound to occur. These young men will eventually enter the field of their choice. Why not help them and encourage them to enter under the best conditions and highest possible standard, instead of leaving them to drift in, unequipped, inefficient and lacking in essential requirements. Is it not best for them to live up to the studies exacted of skilled artisans in other lines, so that they can not only become self-reliant and successful, but reflect credit on the fraternity to which they have given their allegiance?

Trade schools have in the past done much to assist young men to acquire the rudiments of trades in other lines; they have tended to raise the standard of the individuals styling themselves helpers and journeymen by determining the capacity of the beginner, and they have put the highest premium on skill and efficiency.

What I wish to impress most seriously on my hearers is that this question of educating apprentices and journeymen bears a vital and urgent relation to the future success or failure of an industry in which we all feel commendable pride. The New York Trade School, owing to the far-sightedness and philanthropy of its founder, Colonel Tylden Auchmuty, has been in the field to remedy this dearth of skilled mechanics and the crowding out of our home industries of the native-born American workers by foreign skilled labor. Aided by the munificence of Mr. J. Pierpont Morgan and other gentlemen, it has been able to broaden its scope until, to-day, it ranks as the pioneer and largest trade school in the country. With its 6,000 graduates, it has demonstrated its utility and shown the way to those who wish to follow.

Three years ago it took cognizance of the electrical situation, and immediately inaugurated a thoroughly practical course for electrical workers, which became at once an assured success, filling the class room to its utmost capacity and having a waiting list of young men eager to enter the classes.

The first year the class numbered 32. The second year a larger department was inaugurated and 50 were accommodated, and still the waiting list continued to be as large. This year 50 are again at work, and fully that number were turned away.

The course is thoroughly practical, because nothing is taught which is not done by the students themselves, and tested and proved before acceptance. This year a course for journeymen workers in the form of practical lessons will be inaugurated. Its success is problematical, but should it show any signs of growth and interest, it may lead to results which cannot fail to be of interest to the whole electrical fraternity.

American Association of Municipal Electricians.

[Special correspondence of the WESTERN ELECTRICIAN.]

BOSTON, February 4.—The executive committee of the International Association of Fire and Police Superintendents and Municipal Electricians met in this city on January 31st, and among the more important matters considered was a change in the name of the organization, which hitherto has rivaled that of the M. S. F. T. P. O. C. T. A. The object of the committee, however, was to secure a more appropriate name rather than the attainment of brevity, although the latter was also accomplished by the change. It will be known hereafter as the American Association of Municipal Electricians. The membership scope will be enlarged to include any person engaged in municipal electrical work. There were present at the sessions of the committee President J. W. Aydon of Wilmington, Del., F. C. Mason of Brooklyn, N. Y., W. H. Thompson of Richmond, Va., W. T. Elliot of Elmira, N. Y., M. W. Mead of Pittsburg, Pa., and William Brophy of the Boston Wire Department. By invitation there were also present at the conference Wire

Commissioner Flood, John Weige of the Police Department and Brown S. Flander of the Fire Department, this city; S. L. Wheeler of Springfield, Mass., J. S. Wilson of the American Central Light company and W. E. Decrow of the Gamewell Fire Alarm company.

A convention will be held in Wilmington, Del., September 5th.

Pan-American Exposition.

The people of Buffalo and the Niagara region manifest much enthusiasm in the Pan-American Exposition which is to be held at a site on the Niagara River, not far from the Falls, in 1901. The idea is to celebrate by a great fair the achievements of the countries on the American continent during the nineteenth century. As Niagara Falls has played so conspicuous a part in electrical development, and as Buffalo has a respectable claim to be known as the Electrical City, from its extensive use of electrically transmitted power, a very prominent feature of the exposition will be the use of electrical energy in many forms. The show will be given in the twentieth century and is to be essentially up-to-date, modern and progressive. Electricity is relied upon, largely, to attain this purpose.

About \$1,300,000 has been raised already by popular subscription in Buffalo. It is proposed to make the sum \$2,500,000 at least, and Congress has been asked to appropriate \$500,000. Among the electrical contributors were the Buffalo General Electric company for \$25,000 and C. R. Huntley for \$5,000.

A recent issue of the Washington *Past* has the following: Mr. Edwin Fleming, for many years a Washington newspaper correspondent and later editor of the Buffalo *Courier*, is at the Arlington with the large delegation of Buffalo business men who are urging recognition by Congress of the proposed Pan-American Exposition to be held in 1901. "No doubt," said Mr. Fleming last night, "the exposition will embody the greatest display of the practical application of electricity that the world has ever seen. As an electric city Buffalo leads the world. Its natural location, adjacent to the great falls of Niagara, has, together with the wonderful strides made in the development of electrical science, insured for our city a future the possibilities of which can hardly be estimated even by an enthusiastic Buffalonian. In the past five years the steady stream of water which for centuries has poured over the falls has been partially harnessed and converted into a commercial product, and the street cars of our city, 20 miles away, are propelled by the currents generated by the rushing torrents, and the streets are lighted in the same way. Nearly every factory in and about Buffalo is operated by electricity, derived from this source, and the sites along the river bank from our city to the falls are rapidly building up with manufacturing establishments, attracted thither by the unparalleled facilities for obtaining power to revolve the wheels of commerce."

CORRESPONDENCE.

New York Notes.

NEW YORK, February 6.—After about five years of talk the electrical equipment of the elevated railroads in this borough seems at last to be assured. The improvement has been approached slowly, cautiously, falteringly by the management of the Manhattan Railway company. Even now old Russell Sage says: "The board simply gave President Gould the power to go ahead and ascertain which was the better power, electricity or compressed air. We did not determine to equip the road with electricity. The board did not determine on any motive power. The tests with electricity were satisfactory as far as they went, but we have other tests and testimony from engineers that compressed air is much more easily handled, less dangerous and cheaper. It is for President Gould to determine which, after a thorough examination, he thinks is the better motive power." But there is, as a matter of fact, no doubt that electrical equipment will be used. The matter was left entirely in the president's hands at a meeting of the executive committee of the directors held on Wednesday of last week, and on the next day it was announced that Kuhn, Loeb & Co. had undertaken to underwrite the authorized issue of \$18,000,000 of new Manhattan stock and to take all the stock of the issue which is not subscribed for by the present stockholders. It is said that the brokers receive a commission of 2½ per cent. on the entire new issue, or \$450,000, for their services in finding the cash. The old stockholders will be entitled to subscribe for 60 per cent. of their present holdings in new stock at par. "No one seriously doubts that the new motive power will be electricity," says the *Sun*. "Compressed air has been talked about, but the experiments made with it for driving street-cars, both on a branch of the Third Avenue road and also upon the Metropolitan Street Railway company's lines, have evidently not been satisfactory, at least so far as economy is concerned, and the expensive experiment made with an air motor on the elevated road a year or more ago was a failure. The motor tested at that time worked all right, as, in fact, most of the air motors do, some they do not differ materially from steam engines, but the amount of air stored in the motor was inadequate for the work." It is said that a 70,000 horse power plant will be required and that the

cost of the whole electrical equipment will be \$10,000,000 or \$12,000,000. The new stock issue will leave a good margin for other betterments. A special meeting of the stockholders to consider the directors' plan of financing the improvement will be held on February 28th. With the proposed new issue the capital stock of the road will be \$48,000,000. President Gould is credited with the statement that the saving in operating expenses alone will be more than \$1,000,000 a year, which, with other economies possible, is sufficient to pay five per cent. on the new capital which it is proposed to the stockholders to put into the elevated roads, and one per cent. additional on the present capital; in other words, to put the whole property on a sound five per cent. basis. Mr. Gould said this result would be accomplished even if the road should not add an additional passenger to the present traffic, and it is expected, of course, that the greater attraction of the road with electrical operation will greatly increase the traffic. As to the strength of the elevated structure, it is said to be more than equal to any demand that the electrically operated trains will put upon it.

I find this in the *Tribune* of yesterday: "The Metropolitan Street Railway company is pushing the construction of its new power house at Twenty-fourth street and Thirteenth avenue, in which air is to be compressed for use as motive power on the Twenty-eighth street and Twenty-ninth street Crosstown line, but all information as to the progress of the work of installing the compressed-air plant is refused, and no visitors are admitted to the building. Adjoining the power house in Twenty-fourth street, and extending to Eleventh avenue, are the new car barns, which, it is reported, are to house 40 cars. Each car will be equipped with a motor, comprising a cylinder and piston, with a crank attachment to the wheels. The air is to be carried in cylindrical steel 'bottles,' from three to eight feet long, which will be placed under the seats, and the air will be taken from these 'bottles' at 2,200 pounds pressure and delivered by means of a reducing valve to the motor cylinder at 150 pounds pressure. The refilling of the 'bottles,' which is done by means of a hose attachment from the reservoir, it is said, can be effected in less than one minute. It is expected that the line will be in operation with compressed air as the motive power by May 1st."

Much attention has been attracted by the newly organized Astoria Light, Heat and Power company. One paper says that it will erect the largest gas and electric plant in the world at Long Island City. It is stated that a combination has been formed by which the Astoria company will furnish gas to the patrons of all the companies in Manhattan with the exception of the New Amsterdam Gas company. A tunnel is projected under the river starting from Woolsey's Point, on the Astoria shore, running under Ward's Island and coming out at One-hundred-and-tenth street. According to the present plans the tunnel is to be sunk 200 feet below the river bed and will probably be about 6,000 feet long. The tunnel would contain both gas pipes and electric cables. A bill has been introduced in the Legislature giving the company power to build such a tunnel, provided that the mains and pipes be so laid as not to obstruct navigation. This bill also authorizes the Astoria company to "supply gas or electricity to any other company or companies engaged in supplying gas or electricity in the city of New York, and may lease the property of any such other company upon terms to be agreed upon by the boards of directors and trustees of the respective companies, and assented to in writing by the stockholders of such companies holding at least two-thirds of the capital stock of the respective companies." A mortgage for \$500,000 was filed in the office of the Clerk of Queens County at Jamaica on Friday by the Astoria Light, Heat and Power company in favor of the Union Trust company, as trustee, on all the holdings of the power company in Astoria. The mortgage is given as security for an issue of \$500,000 50-year five per cent. gold bonds in denominations of \$1,000 each. The money is to be used in developing and carrying on the business of the new company. M. S.

Canadian Intelligence.

OTTAWA, February 4.—The Dominion Coal company of Cape Breton, in the province of Nova Scotia, proposes to adopt electricity for hauling purposes in its mining operations.

Mr. T. A. Gorham of Port Arthur, Ont., will ask the Ontario Legislature for a charter for an electric railway from Nipigon Station, on the Canadian Pacific railway, to Nipigon Lake.

It is understood that the Cataract Power company of Hamilton, Ont., will very soon make a survey of a definite route for the proposed electric railway from Hamilton to the cities of Galt, Berlin and Gravelly, Ont., with a view to the commencement of building operations in the spring.

Mr. P. Wadell of Trenton, N. J., who owns a controlling interest in the water-works system of that town, is negotiating for the amalgamation of the electric and water-works companies with a view to increasing the power plant, so as to operate both systems and supply power to manufacturers. He has also in view the lighting of the town of Belle Mead, N. J., and the operation of the electric railway and water-works in that town.

The Electric Traction company of Halifax, Nova

Scotia, has increased its capacity recently to a large extent, as well as the track and overhead equipment of its road. In its power station a large quantity of new machinery has been put in, including the latest alternating machines, rotary transformers and tandem-compound engines. Alternating incandescent arc lights have been introduced throughout the city of Halifax, and there are also a great many motors for manufacturing and elevator purposes.

The Sun Life Assurance company has taken possession of the electric street railway of Cornwall, Ont. The road has been considerably run down and will require a large outlay to put it into proper shape. A couple of local men, backed by a syndicate, made an offer of \$70,000 for the road, which was refused. W.

PERSONAL.

F. E. Newbery of St. Louis was a Chicago visitor last week.

The *Scientific American* styles the late John W. Keely a "nineteenth-century thaumaturgist."

Albert Smith, of the firm of Keelyn & Smith, general lighting contractors of Milwaukee, was in Chicago early in the week.

Hugh L. Childress, superintendent of the southern division of the Postal Telegraph company, with headquarters at Birmingham, Ala., died at Chattanooga on February 4th, after a long illness, of meningitis. Mr. Childress was formerly manager for the Postal Telegraph company at Cleveland, O.

Mr. Henry J. Conant, who has been well known as the manager of the Boston office of Westinghouse, Church, Kerr & Co., has been called upon to give his attention to the larger business problems of that concern. Mr. Conant will, however, continue to make Boston his headquarters. As is well known, the entire contract for the new Boston Terminal was executed by him. Mr. Conant was graduated from the Massachusetts Institute of Technology with the class of '87. He is entirely capable of meeting the greater responsibilities of his new position.

Announcement is made of the resignation of John McGhie, manager of the advertising department of the General Electric company, in order to accept an important and responsible position with the *American Machinist* at Cleveland. Mr. McGhie's management of the General Electric company's advertising business was marked by intelligent discrimination, which resulted in most satisfactory returns, and the record which he leaves behind him is highly creditable to himself and satisfactory to the company.

Street-railway men throughout the country will appreciate the *New York Sun's* tribute to "Tom Johnson's self-sacrifice," in which that journal says: "The Hon. Thomas L. Johnson of Cleveland, O., having recently pocketed several millions of dollars by the sale of street-railway franchises in Brooklyn, which cost him little or nothing, announces his purpose of desisting from further efforts to increase his own wealth, and of devoting his energies to the sacred cause of depriving real estate owners of theirs."

A pleasing characteristic of Westinghouse, Church, Kerr & Co., the well-known engineers, is the promotion of their old employes along with the progress and development of their business. The most important appointment recently made by this company was the promotion of Mr. W. W. Churchill to the position of mechanical engineer. Mr. Churchill has identified himself with all of the important contracts handled by Westinghouse, Church, Kerr & Co. during the last nine years. He graduated with the class of '89 at Cornell University, and remained at that institution another year as Sibley fellow in mechanical engineering.

ELECTRIC LIGHTING.

The electric-lighting plant at Royal Oak, Mich., is now in full operation.

The talk of a municipal lighting plant at Three Rivers, Mich., has been dropped.

The city of Algonac, Mich., voted against the issuing of \$10,000 worth of bonds to erect a lighting plant.

The Corunna (Mich.) Lighting company has filed articles of association for \$20,000 with the secretary of state.

The Henderson (Tenn.) Electric Light company has been chartered by T. B. Hardman, N. J. Ozier and others.

An election for the bonding of the city of Charlotte, Mich., to build an electric-lighting plant will be held in the spring.

The electric-light system in Kalkaska, Mich., has been extended. Many private houses and two churches will soon be lighted.

The city of Mount Airy, N. C., will probably issue bonds for erecting an electric-light plant. It is said that George R. Quincy can give information.

The plant of the Tehama Electric Light and Power company of Red Bluff, Cal., recently completed and owned by James Cross of San Francisco, was burned last month. The loss was about

\$12,000; insurance, \$2,000. It is probable that the plant will be rebuilt at once.

The trustees of Nevada City, Cal., rejected the bid of the Nevada County Electric Power company for an electric-light plant, as it was considered too high. It was resolved that a committee of three be appointed to get estimates of cost of an appropriate electric-light plant for the city and report to the board at an early date. Trustees Carr, Rich and Gault were appointed as the committee.

PUBLICATIONS.

Bulletin No. 1 of the Electric Machinery company of Minneapolis has been issued. It treats of direct-connected generators, which are clearly described and illustrated. This company calls particular attention to the quality of material and workmanship entering into its dynamos, and invites comparison with all other manufacturers' products.

A well arranged, well printed catalogue of telephone apparatus, with cover of flexible muslin, is issued by the Holtzer-Cabot Electric company of Boston. The catalogue is No. 35 of the company's issue, and in it are listed magneto bells, hand and power generators, motor-generators, desk-telephone sets, interior telephones, automatic intercommunicating telephones, telephone annunciators, receivers, transmitter arms, repeating coils and other telephone apparatus. The company calls attention to its reputation for high-grade apparatus and its facilities for manufacture.

In the series of attractive Westinghouse publications the descriptive pamphlet on "The Westinghouse Standard Engine," dated MDCCCXIX., holds a prominent place. It gives the essential information (except prices) about these tried and well-known engines in 54 pages of letter-press and illustration. One important statement is this: "In point of economy the Westinghouse standard engine is unequaled by any other simple non-condensing single-valve engine made. On variable loads and light loads we believe it to be superior to the best accepted types of four-valve simple non-condensing engines." The mechanical execution of the book is of high excellence.

ELECTRICAL SECURITIES.

The plan for financing the United Railway and Electric Companies of Baltimore has been completed. There will be a total of \$76,000,000 of stocks and bonds issued. Of this amount \$38,000,000 will be 50-year four per cent. gold bonds, \$14,000,000 cumulative preferred four per cent. stock and \$24,000,000 common stock. The subscribers will be given the privilege of taking a proportion of the cumulative preferred stock. They will be given a bonus in the shape of 25 per cent. in common stock. It is understood that of the authorized issue of \$38,000,000 of bonds \$15,850,000 will be held in the treasury to retire old bonds as they mature and \$4,150,000 to pay for acquisitions, betterments, extensions, etc., leaving \$18,000,000 to be brought out.

Commenting on the fluctuations in the stock market on February 3d, the financial writer of the *New York Sun* says: "The most sensational feature of the day was an advance of more than 10 points in Metropolitan Street Railway after an early decline of more than two points. The net result of the day's trading in this stock was an advance of 8 1/4 per cent. The movement was accompanied by a rumor that the company had acquired control of the Third Avenue surface railroad. A more substantial basis for the rise may be found in the progress that the company is making in the direction of supplying the city or a large part of it with electric light, heat and power. In the last hour the entire list rallied so sharply that many of the early losses were recovered, while in other cases they were reduced to fractions."

INDUSTRIAL COMBINATIONS.

It is reported that negotiations are in progress for the consolidation of all the important freight and passenger car manufacturing companies of the United States. Among the concerns which are said to have given their adhesion to the plan are the Barney & Smith Car company, the Michigan Peninsula Car company and companies in Wilmington, Del., and Buffalo. It is said to be possible that Pullman's Palace Car company will in time enter the projected combination, but this statement is denied.

All the small electric-lighting and power companies in the borough of Queens, New York city, will soon be absorbed, it is asserted, by the Electric Company of America, incorporated on January 5th under the laws of New Jersey with a capital of \$25,000,000, and having its headquarters in Philadelphia. One of the latest acquisitions of this company is the Electric Light and Power company of Jamaica. It is said that the stock of this company has been increased to \$1,500,000, about five times the original amount. With this company as a nucleus the Electric Company of America anticipates spreading out over the entire borough.

The consolidation tendency is shown in all parts

of the country—on the shores of the Pacific as well as in the Atlantic states. It is now announced that all the Tacoma street railways, embracing over 30 miles of cable and electric roads, have been sold to a New York syndicate, which will transfer them to a new company with \$2,000,000 capital, to be styled the Tacoma Railway and Power company. The purchasing syndicate is composed of C. H. Corter of J. P. Morgan & Co., which firm will be the chief stockholder; T. Jefferson Coolidge, Robert Treat Paine, Samuel Carr, C. A. Coffin, Bird S. Coler, Frank Coler, L. H. Hole of New York; Gordon Abbott, S. Endicott Peabody and C. E. Cotting of Boston. The lines will be improved and newly equipped and so connected as to give every part of the city a better service. About half of the capital will be expended on constructing big plants for generating electricity by water power, the latter to be secured from the White, Nisquilly, or Puyallup rivers. It is intended also to promote various manufacturing enterprises, which will utilize the surplus power.

MISCELLANEOUS.

Among the incorporations at Trenton, N. J., last week was that of the Auto-electric company, with \$1,000,000 capitalization and Timothy M. Cheesman of Garrisons, N. Y., Nelson Hiss of New York and Duncan T. McLaren of East Orange as incorporators. This company is to make all kinds of patented articles into which electricity enters as a factor.

Discussing the introduction of automobile vehicles, the *Southern Industrial and Lumber Review* predicts that "It will only be a matter of a few years, no more than 10, before some of the more progressive cities will prohibit the keeping of horses within their corporate limits, just as pigs are now barred from city residence. Streets will soon begin to be set apart for motor traffic only, just as certain paths and sections of parks are now set apart for the bicycle, and gradually the horse will become as rural a sight as a calf or a sheep."

Municipal ownership is attracting so much attention in Chicago that it has become a topic for high-school debating societies. At a recent contest between the Lake View and North Division schools the question was, "Resolved, that the street railways of Chicago shall be owned and operated by the municipality." Paul Steinbrecher and Miss Catherine Mayes, for Lake View, took the affirmative; Florence Weil and Dagny Grevstad argued the negative. Judges Brentano and Smith and Mr. H. H. C. Miller decided the contest, awarding victory to the debaters on the negative side.

A dispatch from Indianapolis states that that city is undergoing an examination, the purpose of which is to discover whether the gas and water pipes are affected with electrolysis. John R. Pearson of the Indianapolis Gas company said that the companies had undertaken the investigation. Mr. Pearson added that the evidences of injury to the gas mains had been few. F. A. W. Davis, vice-president of the water company, said the company did not have evidence that its mains were being seriously injured, but still the injury might be in process.

M. Lockroy, French minister of marine, has communicated to the *Matin* of Paris an account of the successful torpedoing of the French battleship *Magenta* by the submarine boat *Gustave Zédé* in recent practice. "All on board the *Magenta*," he says, "were in a state of feverish excitement, watching the surface of the sea. Suddenly the cupola of the *Gustave Zédé* appeared abreast of the *Magenta*, about 4,000 yards distant, but before the guns of the warship could be trained upon her the submarine boat disappeared beneath the water. The *Magenta* was then ordered to steam ahead, which she did, yet within a minute the *Gustave Zédé's* blank torpedo struck the warship below the waterline."

The War Department, through the chief signal officer, is inviting sealed proposals until February 18th, for furnishing the Signal Service with a quantity of telegraph supplies. Among the articles required are the following: Twenty-five electric bells (five ohm), 100 boxes bluestone, 10 barrels bluestone, 40 battery brushes, 30 dampening brushes, 10 electric buzzers, 50 carbons and prisms, 250 dry-battery cells, 500 Leclanché cells, 500 battery connectors, 2,000 glass pony insulators, 5,000 glass insulators, 250 legless telegraph keys, 250 telegraph sounders, 500 pounds office wire (No. 18), 2,000 battery zincs, 100 push-buttons, 1,000 battery coppers, 25 battery hydrometers, 500 battery jars, 300 telegraph relays, 150 telegraph switches, 30 switchboards (from four to 10 lines) and various other supplies. Prospective bidders may obtain blank forms of proposal upon application to A. W. Greely, chief signal officer, Washington, D. C.

TELEGRAPH.

The Western Union Telegraph company and the Commercial Cable company announce that from March 1st the cable rate to points in Holland and Belgium will be the same as to Great Britain, Germany and France, or 25 cents a word. This is a reduction of seven cents a word to Holland and of five cents a word to Belgium.

"Half-rate telegrams are rapidly becoming a thing of the past," said an official of one of the telegraph

companies to a reporter of the *Pittsburg Dispatch*. "The new fast express trains that leave Pittsburg in the evening are responsible for killing the business. Half-rate telegrams are those filed after 6 o'clock p. m. for delivery early next morning. Business firms here used to send thousands of them. Since the new trains were put on, these firms now write letters and mail them instead of using the wire. We used to depend on these half-rates or 'reds' to keep our operators employed at night. The long-distance telephone has also hurt the business. It will be but a short time until there are no night telegrams."

General Greely, chief of the Signal Service of the army, is preparing a cipher code for use in the army, which, it is estimated, will save the government some \$50,000 or \$60,000 annually in the cost of cable communication with Manila, Porto Rico and Cuba. The tariff to Manila is over \$2 a word, and dispatches to General Otis have been found expensive. It was discovered by the department some time ago that a saving could be made by substituting a designation for the different heads of the War Department, and, carrying this idea further, it was determined to supplement the commercial code now used by the adoption of a number of words to represent certain military phrases and sentences. The code, when completed, will comprise about 2,000 phrases and sentences, each represented by a single word. The saving by this arrangement will be about three-fourths of the total number of words used.

TECHNICAL SCHOOLS.

According to the *Chicago Daily News Almanac* for 1899 the number of schools of technology in the country is 48, with 1,184 instructors and 12,448 students. Of the latter, 1,503 are women. The total income of the schools is \$3,500,190.

POWER TRANSMISSION.

The Collins Gold Mining company of Mammoth, Ariz., is about to utilize the Aravipia River for generating electric power for the entire work of the mills.

The Rosland (B. C.) Air Supply company proposes to erect an electric plant and operate it by water power for the purpose of supplying compressed air or electricity to the Trail Creek mines. The subscribed capital of the company is \$200,000. Work must be commenced within six months.

Los Angeles, Cal., is jubilant over the completion in every detail of the longest power-transmission system in the world, that which supplies the city of Los Angeles with electricity from power developed at the head of the Santa Ana River, 80 miles away. The news was sent from Los Angeles on January 26th, by Senator G. H. Barker of the Edison Electric company and Southern California Power company, to C. A. Coffin, president of the General Electric company in New York, informing him of the completion of the work and its successful operation for 48 hours. The system has occupied several years in building and has caused the expenditure of large sums of money. The wires enter the city through underground conduits.

ELECTRIC RAILWAYS.

Frank A. Miller has been granted an extension of 60 days for the completion of the electric road at Riverside, Cal.

The Council of Pasadena, Cal., has rejected bids of the Terminal company and J. G. Rossiter for a franchise for an electric railway.

It is reported that S. N. Griffith, acting as agent for capitalists, is considering the erection of an electric street railway at Fresno, Cal. A route 10 miles long has been mapped out.

It is reported that the Visalia, Cal., and Tulare motor line is to be changed into an electric road. The stockholders of the road have the matter under consideration. Power is to be supplied by the Mount Whitney Power company.

James H. Boyd of San Bernardino, Cal., will apply for a franchise for an electric-street railroad in that city, to be operated on Third street, from the Santa Fe station east to D street, thence north to Base Line, and out Base Line, continuing to Redlands.

The master's deed conveying to the present owners of the Metropolitan West Side Elevated Railroad company Chicago, all the real and personal property of the company for the consideration of \$6,000,000 was filed for record on February 1st. The master was Elijah B. Sherman. The document bore revenue stamps of the value of \$6,000.

S. N. Griffith has issued circulars stating that a company is now organizing for the purpose of constructing an electric street-railway system in Fresno, Cal., with branches to the extent of 20 miles. Mr. Griffith estimates the cost at \$350,000, and of that amount local capital is expected to subscribe \$50,000. The San Joaquin Electric company will furnish the power.

The Yarmouth electric railroad of Portland, Me., has changed hands, the new owners being a syndicate organized as follows: President, Hon. Seth L. Larrabee; treasurer, Henry P. Cox; directors, the

president and treasurer, with E. B. Wadsworth, W. H. Milliken, Hu ton B. Sargent and J. B. Wharlow. They will put in new machinery and equipment of the most modern character.

The Pacific Electric Railway company has been incorporated for the purpose of constructing and operating electric railway in Los Angeles, San Bernardino, Riverside and Ventura counties, California, and to sell electric power, etc., etc. The principal place of business is Los Angeles, and the capital stock \$1,000,000. The incorporators are I. W. Hellman, Charlie Seyler, J. W. Hellman, I. M. Nickell, W. C. Patterson and others.

One of the most important measures that will come before the present session of the Massachusetts Legislature is the bill compelling the electric-railway companies of Boston to equip the front platforms of their cars in winter with vestibule protection for the motormen. The matter has even been made the subject of pulpit eloquence, some of the ministers of Boston churches taking up the cause of the employes and preaching against the iniquity of exposing the men to the weather. The existing law on the subject exempts cities of over 50,000 inhabitants, and only in smaller places is the protection afforded. It was claimed that vestibules on cars in crowded cities would tend to increase the liability to accidents, by reason of their obstruction of the view of the motorman.

The company which proposes to build an electric railway from Chicago to Lake Geneva has been incorporated. The capital stock is \$150,000. The incorporators are H. H. Windsor, H. T. Windsor, C. N. Bates, C. T. Bundy, and L. C. Church. H. H. Windsor was elected president, C. N. Bates vice-president, H. T. Windsor secretary and treasurer, C. T. Bundy was appointed attorney for the road and H. T. Windsor general manager. The name adopted is the Chicago, Harvard and Lake Geneva Electric Railway company. The principal office will be in Walworth. The ordinance granting this proposed road a franchise in Chicago was introduced in the council by Alderman Kimbell. The plan is to start at State street, near the river, on the North Side, then follow a sort of zigzag route parallel with the river to North avenue, thence west over a right-of-way to be acquired to the city limits, where it will take a northerly direction to the summer resorts in Northern Illinois and Southern Wisconsin.

TRADE NEWS.

The Cleveland Woolen Mills of Cleveland, Tenn., are in the market for a dynamo of from 35 to 50 kilowatts' capacity, direct or alternating current. Julius Hardwick, Cleveland, Tenn., is the secretary of the company.

The offices of the Westinghouse Electric and Manufacturing company and allied companies in Chicago have been brought together on the twelfth floor of the New York Life building, La Salle and Monroe streets. The rooms are very conveniently arranged around the eastern end of the corridor, the numbers ranging from 1217 to 1224. They are handsomely appointed, and pleasant quarters are afforded for managers, engineers, salesmen and the office force.

The Moloney transformer has many new and essential features embodied in its construction that merit the careful consideration of central-station managers. It has been constructed strictly upon scientific points, with a view of combining every modern improvement known in the manufacture of transformers. It covers desirable features of economic distribution, combined with other salient features of importance. This transformer has met with unprecedented success wherever it has been used, and the selling agent, the Western Electrical Supply company of St. Louis, Mo., have been kept busy in supplying the constantly increasing demands for it. The manufacturers of this transformer have, however, recently increased their plant to such an extent that the Western Electrical Supply company is now placed in an excellent position to give prompt shipment and handle all orders to the entire satisfaction of its patrons.

Mr. Hugo Reisinger, the importer of the Electra Nuremberg carbons, says that the change now taking place in electric-arc lighting is strikingly shown by the increasing demand for Electra carbons. This is largely due to the rapid introduction of enclosed long-burning arc lamps for direct-current, alternating-current and series lamps. "It has become necessary to run the Nuremberg carbon factory night and day to keep up with the orders that are sent from this country," says Mr. Reisinger, "while at the same time the demand for carbons for the constant-potential, direct and alternating-current, open-arc lamps shows no falling off. The facts cited tend to show that the enclosed long-burning arc lamp is rapidly superseding the open-arc lamp for interior use, while it is displacing the series high-tension open arc lamp from the streets. One need not be a prophet to see that the present rate of change will very shortly revolutionize the carbon trade, and that the low-tension carbon, like the poor old base, will have to give place to uses or give up the fight entirely. Professor Henry S. Carhart, some years ago, predicted this, by stating that the days of cheap and inferior carbons should soon be past."

BUSINESS.

The Western Electrical Supply company of St. Louis gives notice of a change in prices. It says: "On account of the rapid and marked advance in prices of so many goods in the electrical supply line, we are compelled to withdraw all prices quoted either by letter or by discount sheets of our catalogues Nos. 14, 16 and 18. Corrected discount

sheets will be prepared and forwarded to everyone having our catalogues at the very earliest possible moment."

The Electric Appliance company is very proud of its new building at 92 and 94 West Van Buren street. It claims that its new location gives it the largest electrical supply house in the country, with unequalled facilities for doing business and carrying very large quantities of material. The building

is about 50 by 90 feet, five floors and basement, with light on three sides, and is certainly an ideal building for any line of business. It should be visited and inspected to be appreciated.

The Manhattan Electrical Supply company, 32 Cortlandt street, New York, is kept busy supplying orders for its Mesco dry battery. An output of over 5,000 cells a day is reported, and the factory force is said to be working night and day.

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued January 31, 1899.

618,391. Electric Furnace. Hugues Boyv, Geneva, Switzerland. Application filed April 14, 1898.

The furnace body is composed of conducting material, carbon blocks are supported in upright position on the body, each of the blocks forming a lower electrode, with a filling of carbon powder between the blocks, carbon plates are arranged between the upper ends of the blocks and resting upon the filling, and additional electrodes are arranged and supported above the lower electrodes, the lower electrodes being of such size as to be rendered incandescent by the passage of the electric current.

618,404. Electric Pump. Carl Eickemeyer, Yonkers N. Y. Application filed January 22, 1898.

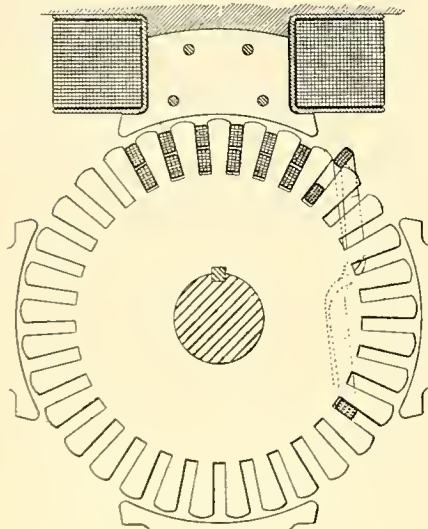
The electric motor is provided with vertical field-magnet cores, and the incased pumping mechanism is driven by the motor, the casing being supported by the field-magnet cores, and the piston rods and armature shaft being substantially parallel, a worm is connected with the armature shaft, and a suitably supported gear wheel intermeshing with the worm and connected with the piston rods of the pumping mechanism.

618,429. Electric Railway. James F. Munsie, New York, N. Y. Application filed July 26, 1897.

A surface-contact electric railway is described comprising a series of circuit-controlling boxes distributed along the track, and arranged in groups laterally displaced at intervals to engage different circuit-controlling bars carried by the vehicle, to prevent heating of the same.

618,562. Ventilating Apparatus. Frank P. Donahy, Washington, D. C. Application filed August 10, 1898.

The transom-operating means are controlled by a motor with electrical devices embodying a pivoted armature with projections and spring contacts in the path of the ends of the armature constructed and arranged to be actuated by a change in the temperature.



NO. 618,727.

618,578. Alternating-current Motor. Edward C. Newcomb, Brookline, Mass. Application filed May 16, 1898.

Included in this arrangement are an armature, with coils closed upon themselves, a field-magnet with two sets of poles, the one set being in short circuit to the other set, means for cutting in and cutting out the short coils, the ampere turns of the main coils gradually diminishing from the outer edges of the poles to the center.

618,579. Commutator Short-circuiter. Edward C. Newcomb, Brookline, Mass. Application filed June 21, 1898.

The circuit closer is movable into and out of contact with the segments of the commutator, and a device is provided manually and mounted upon the shaft of the commutator for controlling the circuit closer, the device consisting of a handle connected by a rod to the circuit closer, and having a hole therein, and adapted to turn upon the rod relatively to the shaft, a pin carried on the shaft and located to fit into the hole in predetermined positions, and a spring tending to press the circuit closer against the segments.

618,604. Signal-controlling Track Instrument. Edgar A. Holloway, Gilroy, Cal. Application filed April 14, 1898.

An apparatus for signaling the approach of trains consists of electromagnets, with armature, latches and latch bars, insulated track sections, battery and connecting wires and a means for restoring the parts to their normal position after the train has passed, consisting of an electromagnet with an armature mounted upon a fulcrumed movable bar, disengaging arms connecting with the latches of the first-named magnets, the arms being acted upon by the movable bar of the disengaging magnet, and wires connecting with independent insulated track sections, and a battery whereby the disengaging magnet is energized.

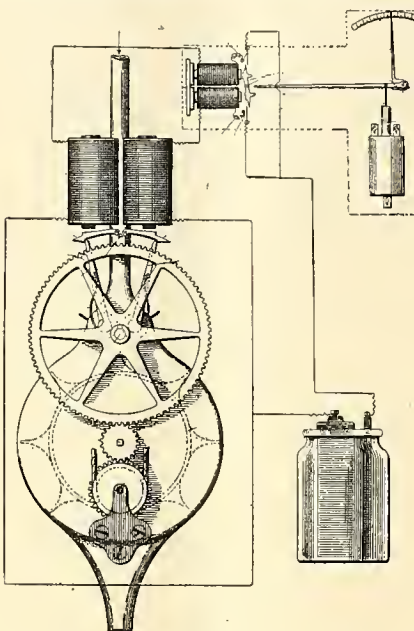
618,619. Telephone Switchboard. James M. Overhimer, E. Wood, Ind. Application filed October 10, 1898.

One claim is given. The combination with a jack, a drop and a pl. z. of a drop-restoring device actuated by

the plug to restore the drop only when the plug is withdrawn from the jack.

618,635. Electric Battery. Arthur R. Adams, Surrey, England. Application filed March 29, 1897.

The process of compounding an exciting fluid for electric batteries consists in preparing first a chromate solution, adding sulphuric acid, then adding a solution of a nitrate of the alkali metals, then adding a solution of a mercury salt and then mixing thoroughly at a temperature of about 150° Fahrenheit.



NO. 618,562.

618,646. Electric Illuminated Clock Dial. Richard T. Crane, Jr., Chicago, Ill. Application filed February 18, 1898.

The indicating pointer moves over the clock dial, and means for illuminating the indicating characters successively and synchronously with the registration therewith of the pointer are provided.

618,670. Electric Clock. Walter W. Hastings, Jersey City, N. J. Application filed November 24, 1897.

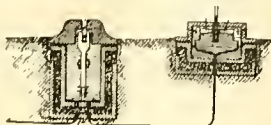
A swinging pawl is movably mounted on the pendulum rod and forms part of an electric circuit, and means are provided for closing the circuit operated by the pawl when the limit of movement of the rod reaches a predetermined minimum point.

618,674. Trolley Wheel and Support. William P. Holt, Savannah, Ga. Application filed June 2, 1898.

A trolley wheel support comprises a trolley-pole having a forked frame at its upper end, a ring pivotally mounted in the ends of the forked frame, a second ring pivotally mounted within the first-named ring, forming a gimbal-joint, a shaft having bearings thereon for the trolley wheel, mounted within the inner ring, and means for preventing the gimbal-joint from swinging too far.

618,699. Prepayment Electric Meter. Francis M. Long and Ernest Schattner, Norwich, England. Application filed July 18, 1898.

Claim one is given: In a prepayment electric meter and in combination, a lever, a circuit, a contact-making device in the same operated by the lever, means controlled by a coin for moving the lever and making the contact, a voltmeter, the passage of the current through which will raise the lever and break the contact, and means connecting the voltmeter and the lever.



NO. 618,429.

618,702. Direct-acting Reciprocating Electric Motor. James H. Mason, New York, N. Y. Application filed March 24, 1897.

A direct acting reciprocating electric motor is described comprising a pair of field magnets spaced apart, an armature arranged to reciprocate between them, the one being provided with centrally arranged conical recesses and the other with centrally arranged conical projections located at all times partially or wholly within the recesses, the pair of magnets and the armature being provided with adjacent vertical annular faces surrounding the projections and recesses, whereby the magnetic field is enlarged, means for maintaining a constant electric current in one direction through the armature, means for energizing the field magnets and means under the control of the movement of the armature for changing the direction of the current through the field magnet coils.

618,703. Apparatus for Manufacturing Filaments

for Electric Lamps. Hiram S. Maxim, London, England. Application filed November 8, 1898.

This apparatus consists of a vessel provided with trunnion bearings to permit of its moving in a vertical plane, of a screw cover for hermetically closing the vessel, of an electrically insulated plug therein, of a hollow head to the plug communicating with inlet and outlet nozzles through which water enters and leaves the hollow head to keep the latter cool, of electrodes mounted in holders located at opposite ends of the vessel, of stems on the holders extending to the exterior of the vessel and formed with passages communicating with the holders and with inlet and outlet nozzles through which water enters and leaves the holders to keep them cool, of a nut carried in a frame and engaging with screw threads on one of the stems of the electrode holders, of handles on the nut for turning it and thereby shifting the holder so as to adjust the distance between the electrodes, of a lining for the vessel, such lining having a spiral water course for the entrance and exit of cold water, and of a source of electricity for supplying electric current to the electrodes.

618,704. Method of Manufacturing Filaments for Electric Lamps. Hiram S. Maxim, London, England. Original application filed November 8, 1898. Divided and this application filed January 5, 1899.

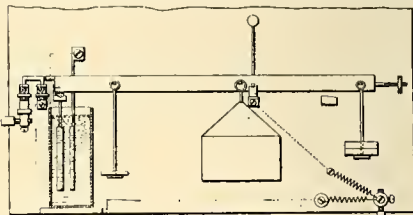
The process of manufacturing high resistance filaments for electric lamps consists in subjecting solid or liquid carbonic acid and carbon in a closed vessel under great pressure to the action of the voltaic arc, thereby converting the carbon into a dense crystalline form, then comminuting the resulting product, mixing the same with a suitable binder, molding the mixture into filaments and finishing the filaments in the usual manner.

618,706. Electric Lamp. John S. Mead, Mount Vernon, N. Y. Application filed September 19, 1898.

The claim is given: In an electric lamp, a casing, a battery in the casing, a reflector arranged in said casing and having a lens socket, a block of insulating material, a contact plate secured to the rear side of the block, fingers extended from the front of the block and connected to the reflector, whereby the said block and contact plate are supported by the reflector and removable therewith from the casing, a contact point on the reflector and a circuit closer for closing the circuit through the contact point and plate.

618,727. Armature for Dynamo-electric Machines. Edward D. Priest, Schenectady, N. Y. Application filed August 26, 1898.

An armature for a dynamo-electric machine is described comprising a toothed body of metal, having coil slots between the teeth, the teeth being so arranged that they decrease in height toward the slot adjacent thereto, and coils mounted in the slots.



NO. 618,699.

618,773. Automatic Circuit Closer. Henry F. Blackwell, Jr., New York, N. Y. Application filed January 8, 1898.

Comprised in an alarm box are a main circuit, an auxiliary circuit, an alarm circuit, a switch normally closing the main circuit, a cam for moving the switch to close the alarm circuit, a rack for rotating the cam, and an electromagnet in the auxiliary circuit for controlling the rack.

618,812. Electrical Protector. David J. Cartwright, Boston, Mass. Application filed January 11, 1897.

This is an automatic electromagnetic strong-current protector for electrical devices, and consists of an electromagnet, a base plate supporting the same, a laminated core for the same, a pole piece of magnetic metal on the core, a block of hardy fusible electric conducting non-magnetic material secured on the pole piece and a metallic piece extended at right angles from the pole piece and attached to the base plate and forming part of a circuit through the magnetic pole piece and contact block secured thereto.

REISSUE.

11,713. Storage Battery. Ralph Ashley, Port Republic, N. J. Application filed April 9, 1898. Original No. 591,265, dated October 5, 1897.

A storage battery comprising a series of cups or trays each formed of relatively thin, hard rubber or non-conducting material, and one nested within another and having its weight transmitted directly to the bottom portion of the one below it by having its bottom portion contacting directly with and resting upon the bottom portion of the one below it, there being openings between the trays for the escape of gases.

DESIGNS.

30,102. Core Plate for Dynamo-electric Machines. Edward D. Priest, Schenectady, N. Y. Application filed November 4, 1898. Term of patent, 14 years.

30,109. Lightning Arrester. Abraham Morgan, Youngstown, O. Application filed June 16, 1898. Term of patent, 14 years.

Western Electrician

EVERY SATURDAY.

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No. 7

Two New Telephone Exchanges in Chicago.

As the result of about 18 months' work in the downtown district in Chicago, the Chicago Telephone company has opened two new exchanges and added very largely to its plant of underground conduits, providing offices in each of which upward of 5,000 telephones can be handled, in addition to the main office in the Telephone building at Washington and Franklin streets. This will make the total capacity in the downtown district in Chicago about 18,000 instruments.

The first of these offices was opened late in October at the Chicago Title and Trust building, 100 Washington street, and is known as "Central." To it all "express" lines have been transferred and all the metallic-circuit lines in the district south of the Chicago River, east of La Salle street and north of Adams street. The second office, known as "Harrison," is located in the Manhattan building, 315 Dearborn street, and will accommodate circuits south of Adams as far as Twelfth street and east of Clinton street to the lake.

Photographic views of the new exchanges are reproduced in the illustrations on this and succeeding pages. Fig. 1, the upper picture on this page, shows the greater portion of the telephone switchboard at the Harrison exchange. The lower view (Fig. 2) represents the operating

this battery are of exceptional size; some of them are shown at the left in the picture. The smaller machines in front are the combination ringing and busy-back signaling machines. They are operated on the 220-volt circuit. The power-plant switchboard is of white marble and is shown back of the machines. The machinery equipment is in duplicate; one motor-generator and one ringing machine are ample for the requirements of the plant. As a further measure of safety, several sources of current are available in an emergency. A portion of the large distributing board is shown on the right. The framework of this board is of iron, and each circuit

The telephone switchboards are of the automatic signaling type, each line terminating in an answering jack, giving a signal by means of an incandescent lamp. The calling subscriber governs the movements of the operator throughout the call by means of a lamp opposite her cords. These exchanges represent a number of improvements over other boards of this type which have been installed during the last year, and in operation they have proven to be very successful. The methods for handling trunk lines are said to be the most rapid and accurate yet devised. The machine ringing plan, which was thoroughly tested in the "Express" exchange,



Fig. 1. "A" Switchboard at "Harrison"



Fig. 2. "A" and "B" Switchboards at "Central."
TWO NEW TELEPHONE EXCHANGES IN CHICAGO.

boards at the Central exchange, where all the succeeding photographs were taken. Fig. 3 shows the chief operator's desk and affords a better view of the "B" or trunk board than is given in the general view of this exchange (Fig. 2). A portion of the rear of the "A" or answering board, with the line relays on the left, is shown in Fig. 4, while the operators' sitting and lunch room upstairs is illustrated by Fig. 5.

The power plant of the Central exchange is shown in Fig. 6 (page 94). The machines are elevated from the floor and stand on a marble slab. The two larger machines are motor-generators taking 220-volt current from the Chicago Edison mains and reducing it to about 24 volts for charging the storage battery. The current for the talking circuits is furnished by the storage battery. The cells of

is provided with a lightning arrester. In case of a heavy discharge of current on the line the normal insulation protection of the arrester is broken down and the high-potential current is grounded through the frame of the switchboard without damage. The overhead running-box containing the circuits from the cable-heads to the distributing board is shown in the upper right-hand corner of the picture.

Both in the Central and Harrison exchanges relay multiple boards of the most modern type have been installed, together with generating plants, storage batteries, etc. The current for signaling and for transmission is furnished from the Central office, where a constant pressure of 24 volts is maintained. Thus the transmission is always at the maximum of efficiency.

is used, and the bell of the subscriber is rung intermittently until the call is answered.

In the Central office, which occupies the rear half of the second story of the Title and Trust building, the "A" or answering boards extend along the west wall of the large operating room (Fig. 2), and the "B" or trunk boards along the east wall. The relay racks (Fig. 4) are built into a partition which separates the wire chief's room (Fig. 6) from the operating office. The floors are laid throughout. In the wire chief's office are located the cable terminals, the distributing boards, motor and generator plants, storage-battery plant and power switchboards.

The traffic handled over the lines and trunk lines of this Central office continues to be the heaviest ever recorded on a like number of telephone lines. The subscribers whose lines are here operated use their telephones more than in any other exchange of which a record has been made. The operating forces which have handled this heavy traffic so successfully in the old Express office during the last four years are doing even better work with the new relay boards in Central. "In respect to every detail of mechanism," said an officer of the Chicago Telephone company recently, "the design of relays, lamps, keys, plugs and the many other pieces of apparatus necessary to the operation of the exchange, probably the best work ever done up to the present time is to be found in the new Central and Harrison exchanges." It is perhaps unnecessary to remark that the switchboards were built by the Western Electric company.

The Harrison office is located on the seventh floor of the Manhattan building, occupying the north half of that building. The cables are led up through iron pipes from a manhole in front of the building on Dearborn street. They are led first through the

wire chief's room, where distributing boards, relay boards, power plant, etc., are located. The operating room occupies the north end of the building. Here the relay multiple boards extend in two lines—the "A" boards along the north wall of the room and the "B" boards along the south wall. In Fig. 1 the "A" board is shown.

In both Central and Harrison exchanges commodious quarters are provided for the operators. A large buffet, from which luncheon is served each noon, contains dishes and the necessary paraphernalia, in charge of the matron. A cosy reading room, with electric reading lamps, lounging chairs, etc., is provided for the operators while at rest. The girls' sitting room in the Central exchange is shown in Fig. 5. The quarters are to be enlarged in the spring.

The next move to be made by the company in the enlargement of its exchange will be the building of an addition to the main office at 203 Washington street, which will occupy a space as large as the present building, 40 by 90 feet, and in which a new operating office will be located on the seventh floor. Here a relay multiple board will be located, which will provide for metallic circuits of the district, and the toll and long-distance operating rooms will also be cared for, as well as the general offices of the company. It is expected that the new building will be completed by July 1st. A new exchange, to be known as "Monroe," is also to be established in a new building to be built by the company and completed in June. This will be located on Sangamon street, near Monroe street, and will care for the telephones in the eastern portion of the West Side.

Sale of the "Electrical World."

It was made known last week that the *Electrical World* of New York had been sold by Mr. W. J. Johnston to Mr. James H. McGraw, the principal owner of the *Street Railway Journal* and the *American Electrician*. The transfer includes the publishing and book-selling business of the W. J. Johnston company. It is said that Mr. Johnston will retire from electrical journalism.

Institute Meeting in Chicago.

Through the efforts of the recently appointed local honorary secretary, Mr. R. H. Pierce, a meeting of members of the American Institute of Electrical Engineers was held at the Technical Club, Chicago, on Wednesday evening, February 15th, the date of the regular Institute meeting in New York. Mr. B. J. Arnold read Mr. Lloyd's paper on "Storage Batteries and Railway Power Stations," and there was a discussion in which Joseph Appleton, chief engineer of the Electric Storage Battery com-

Interior Electric Wiring.

By H. N. GARDNER.

Probably the kind of electric wiring in which there is the most poor work done, because poor workmanship can there be hidden, and because many young and comparatively inexperienced wiremen believe that they are capable of performing the work, is the ordinary concealed house wiring for lights.

well as the inside of the door, should be lined with asbestos cloth.

If an overhead service is used outside, so that the wires will enter through a gable, this box can probably be best arranged for in the wall of a second-story closet, as near the center of the house as possible, and placed a suitable distance from the floor to be easily accessible.

When possible it is always desirable to have the



FIG. 3. TWO NEW TELEPHONE EXCHANGES IN CHICAGO.—CHIEF OPERATOR'S DESK AND "B" BOARD AT "CENTRAL."

Starting with the wiring of a frame house of moderate cost, where the simple method of porcelain knob and tube work is followed, an effort will be made to give a few rules that will apply to such work.

The first thing to determine is where the center of distribution for the circuits will be placed. In a house of not over 10 rooms, it will probably be possible to arrange to run all circuits economically from one center. Should there be more rooms, it may be found more convenient to arrange for two or more centers. It should never be planned so that the center of distribution will be in the ceiling

entrance made through a side gable. A fusible "main" block should be placed as near as possible to the entrance, and near that should come a double-pole switch. It is usually convenient, and far better, to arrange for enclosing the entrance cut-out and switch in an asbestos-lined box; and if a meter is to be used, the box can easily be made large enough to contain that also.

Large enough wire should be used, in running the mains from the entrance to the center of distribution so that the voltage drop with all the lights of the house burning, will not be at most one per cent. The proper sized wire for this can easily be determined from the tables given in the article appearing in the *WESTERN ELECTRICIAN* for October 8, 1898. These main wires can usually be most conveniently led directly from the entrance to the third-floor timbers, and along them and down the studding, to enter the box at the center of distribution at the top.

The wires for the branch circuits can usually be most conveniently led from the central box through the sides, the holes being bored through the sides of the box and the studdings to which the box is attached. Sometimes it is easier to use main blocks for the bottom cut-outs instead of branch blocks, when the circuits fed from them will be taken out of the bottom of the box.

In leading the wires for the different circuits from the center they can be run up or down on the studding, but care should be taken not to run the wires less than six inches apart, and wherever possible concealed wires should be kept at least 10 inches apart. If it is necessary to run three wires for a short distance in some places between two timbers 16 inches apart on centers, the wires can be kept six inches apart by nailing pieces of boards between the studdings wherever knobs should be placed, and screwing the middle knobs to these boards.

In planning for the different lights, it should be arranged so that not over eight, or at most 10, 16 candle power lamps, or their equivalent, should be placed on any circuit with a 100 or 110-volt service, or not over six or seven for a 50 or 52-volt service. This will permit the use of a five or six-ampere fuse, and the fuses can all be placed in the asbestos-lined box at the center of distribution, making it unnecessary to place a fuse in a fixture canopy—something that should not be done.

Wire large enough to carry current for all of the lights of the circuit with not over a one per cent. drop should be used. It is best, however, to use no wire smaller than No. 12, B. & S. gauge, except to run for short distances for single outlets, and some inspectors will not permit the use of anything smaller than No. 12 for any wiring. Nothing smaller than No. 14 should be used even for fixture wiring.

In boring through timbers to run wires, care should be exercised not to bore holes in places that may have too much of a weakening effect. All holes should be bushed with porcelain tubes, and where thick timbers or two timbers together are encountered two tubes or pieces of two tubes should not be used for bushing, but tubes long enough to go entirely through the timbers should be procured.

Holes should be bored as near the center of timbers as possible, and they should not be bored any more on the slant than is necessary. An appliance is now to be had making it possible for a workman

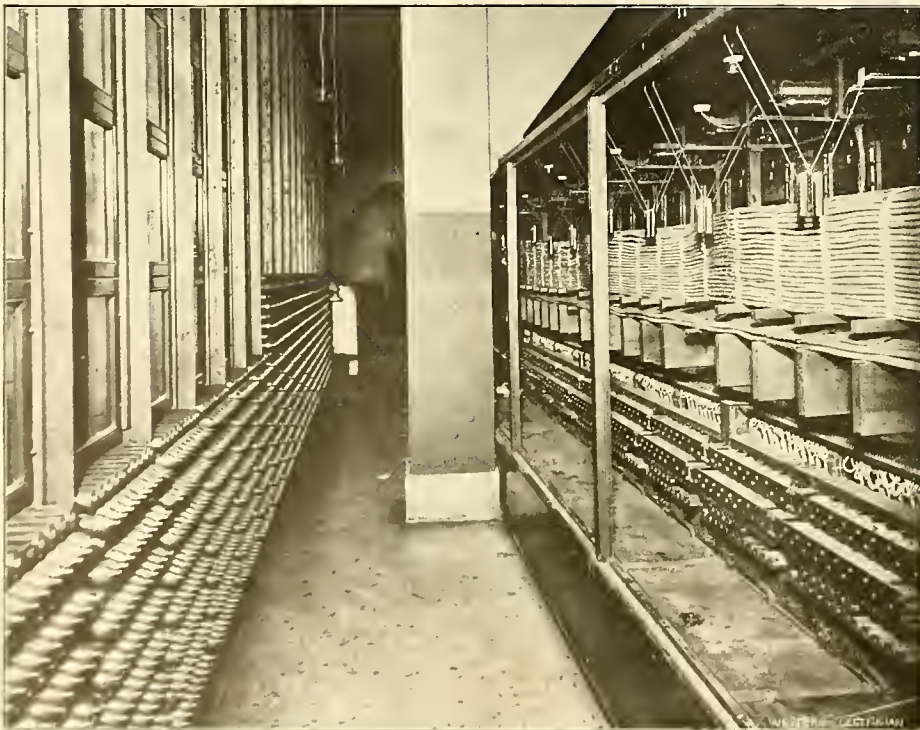


FIG. 4. TWO NEW TELEPHONE EXCHANGES IN CHICAGO.—BACK OF ANSWERING OR "A" BOARD AT "CENTRAL," WITH LINE RELAYS ON THE LEFT.

pany, and others took part. Many of the gentlemen present took dinner together at the club, previous to the meeting, and the evening was a pleasant one socially as well as profitable from a practical point of view. No western meetings of the Institute had previously been held for some time, and Mr. Pierce's effort to revive them seems to promise success.

A concession for the construction of an electric street railway at Chihuahua, Mexico, has been granted to Frederico Sisniega, Julio Meyer and Salvador Arellano.

of a clothes closet and the fuse blocks screwed up on the ceiling exposed, as is still done in some cases. Nor should the fusible cut-outs be put up exposed in any part of the house. It is usually more convenient, both for installation and future maintenance, to arrange so that the cut-outs can all be placed in a small box in a side wall between two studdings. Such a box can be made just the depth of the studding, including the back, and a door can afterward be placed over the front, so that it will be no disfigurement to a wall; and it can usually be placed in the wall of a closet or some place where it will be out of sight and out of the way. This box, as

to stand on the floor and bore holes in the joists of the floor above, boring them squarely through the timbers, and also making it possible for one workman to bore as many holes in a day as can three men using an ordinary brace and bit. By this process, too, the tubes can be placed in a direct line, making it much easier to pull the wires through several tubes at a time, and decreasing the danger of breaking the tubes by the process. If the holes are bored slanting, the tubes should be inserted with the head up, except for occasional places, where the other way may be better without leaving danger of the tube slipping out.

The location of all wires of a circuit should be planned before the holes are bored; and whenever it is necessary for the wires of a circuit to cross, or the wires of different circuits, the holes should be bored either higher up or lower down than ordinarily, thus giving an opportunity for other wires to pass and still leave a good distance between them. The holes should never be bored nearer the edge of the timber than $2\frac{1}{2}$ inches, in order that the tubes may not be in danger of being broken by having nails driven into them.

Wires can be run straight through from timber to timber without any other support than the tubes; but if the timbers are far apart, the wires should be supported on knobs placed on both timbers near the tubes.

Whenever wires are run along timbers, they should be supported by and tied to knobs placed not more than five or six feet apart in any case, and the underwriters say $4\frac{1}{2}$ feet. Knobs should be

the plaster; but I believe that it is better to put them through from the other side. The tubes should be left projecting well through the plaster, and when the fixtures are put up they can either be broken off or pushed back. Of course, care should be taken in all places to keep the wires drawn tight, whether when running through the joists or along them.

Wherever it is possible to induce the house builder to add enough to the cost of wiring, the convenience of electric lighting should be thoroughly brought out by controlling the lights of chandeliers especially by switches conveniently placed in the side walls, near the door most frequently used to enter the room.

The convenience can be greatly increased at a slight additional expense by having the lights in both the upper and lower halls controlled from both floors by three-point switches. In some cases it may be still more convenient to arrange a light so that it can be either turned on or off from three or more points. This can be easily done by a system of wiring resembling that for three-point switches, and for which a special switch can be arranged.

Where current is used in combination fixtures, it is better to use double-pole switches. Some insurance inspectors insist on this, but inconsistently permit the use of three-point switches, which are practically the same as the single-pole.

If surface switches are used, a board should be fastened between the studdings at the switch outlet, the same as for light outlets. Holes should be bored

Electricity on Board Ship.

BY S. DANA GREENE

PART I.

While the title of this paper is intended to embrace the application of electricity aboard ship in the merchant marine as well as in the navy, I shall confine my remarks principally to the war vessel, for the service requirements of electrical apparatus on the latter are quite as severe as on the former, while the limiting conditions of weight and space are much more severe. It may be safely assumed, therefore, that any application which can be made to advantage aboard a man-of-war will be equally advantageous on board a merchantman.

On shore the advantages of centralizing the manufacture of electric power for industrial purposes in one plant and distributing this power by suitable means to individual consumers are so well known and the industry is so well established, that it seems hard to realize the fact that it has all been accomplished in less than 20 years, and that it is less than 10 years since it was a difficult matter to interest capital in such undertakings.

For several years after the industry was well established ashore little or nothing was done aboard ship. This was due principally to two causes:

First—Seafaring men are notoriously conservative about introducing new ideas or new apparatus aboard ship, which may not prove successful, and which may, on the other hand, fail in the middle of a long voyage when facilities for repairs are not at hand, and when a breakdown may be a very serious matter to the safety of the ship or the lives of the officers and crew. This conservatism is particularly strong in the British navy, the greatest in the world, where no machinery is ever introduced when the work can be done as well by hand, and where "simplicity" is the first requirement for all machinery.

The modern warship is a complex piece of mechanism at best, and I think the established policy of our English cousins to eliminate rigidly all unnecessary complications is wise—one that can well be followed by other navies, and particularly our own, where there has been a tendency to introduce too many novelties and labor-saving devices, at the expense of simplicity and safety.

Second—Electrical men, while generally unfamiliar with the conditions of sea life, knew nevertheless that three great enemies of electrical apparatus—salt air, moisture and heat—were always present aboard ship, and they feared them.

However, the great advantages of electric lights gradually overcame the sailor's conservatism and the electrician's fears, and lighting plants have been generally installed aboard ship for several years, in spite of numerous troubles at first, both with the apparatus and with the wiring.

The great advances made in the construction of electrical apparatus and the methods of distribution enable us to say to-day, and to prove, as I shall hope to prove with a full knowledge of service conditions, that electrical applications can be made with as little fear and with as great certainty of success aboard ship as they can ashore.

The recent position reported to have been taken by one of the naval-bureau chiefs that such applications should not be further extended on our warships at present, because we did not have the trained men to care for the machinery, it seems to me, absolutely untenable. If it is demonstrated that an electric motor is better adapted to drive a deck winch, for example, than a steam or hydraulic or compressed-air motor, then it should be installed, and the necessary men to operate it can and should be obtained. If the course suggested by the naval officer referred to had been followed in our navy for the last 50 years, we would still have sailing vessels (the frigates and line-of-battle ships of Nelson's day), and our recent unpleasantness with Spain would have terminated with very different results.

Assuming, then, as every reasonable man both in and out of the navy does assume, that electrical apparatus can be made to work on shipboard, let us examine the conditions of the modern war vessel as we find them, and see where electricity can be advantageously introduced, having in mind always the necessary requisites—safety, simplicity, efficiency and reliability.

The modern first-class battleship requires about 2,000 indicated horse power to drive all the auxiliaries at full load, and the first class cruiser about 1,200 indicated horse power. These auxiliaries, however, are never all in use at the same time, using maximum power, and it can be assumed that about one-half these amounts (i. e., 1,000 indicated horse power and 600 indicated horse power) will be required at any one time. They are scattered all over the ship, from the anchor hoist forward to the steering engine aft, and from the deck winches and boat cranes on the spar deck to the bilge and fire pumps in the engine and fire rooms, 30 or 40 feet below. Some of them, such as condenser, air circulating, feed, bilge and fire pumps and fire-room blowers, are necessarily located within the engine and boiler-room compartments, where the temperatures are always high and where steam, oil, water and coal dust are always present in greater or less quantities. Others, located on the spar deck, are exposed to salt water and air and to the varying conditions of sea and weather.

With these scattered locations, it is obvious that



FIG. 5. TWO NEW TELEPHONE EXCHANGES IN CHICAGO.—OPERATORS' LUNCH AND SITTING ROOM AT "CENTRAL."

placed in many places closer than this. A knob should always be placed near a bridging between the joists when the wire runs beneath it. If one wire running along a timber crosses another running from one joist to another, a knob should always support it as near as possible to the place of crossing. Whenever a wire passes through a timber and then runs along the side of it, a knob should always be placed near the tube, and even if it brings the head end of the tube down, that end should always be placed so as to come on the side where the turn is made, unless it is turned on both sides of the joist.

A knob should always be placed at the point nearest the iron if it is necessary for the wire to pass near a water or gas pipe. The wires should also be supported by knobs, placed as near as possible to light or switch outlets. The rules given for fastening wires to knobs in a former article (WESTERN ELECTRICIAN, October 8, 1898) should be followed in this case. Knobs should never be fastened to the timbers with nails, but should be put up with screws.

If a house is also being piped for gas, the plumber should be requested to make the gas nipples as short as possible and permit the threaded part to project beyond the plaster. In this way it will be possible, in putting up the fixtures, to bring the insulating joint close to the wall and prevent the wires from being twisted up against the grounded part of the pipe.

In bringing out the wires at light outlets, a board should be nailed up between the joists or studdings, with its face coming flush with the edge of the timber. Three holes should be bored in this, one to be slipped over the gas nipple, or else a notch can be cut for the nipple to slide into, and the other two holes near that, through which the wires and tubes can be slipped. Some underwriters demand that the tubes at outlets shall be slipped up after the wires are drawn out, leaving the head outside of

in this, through which tubes can be placed, so that the wires will come just about far enough apart to be handy for the switch terminals. The wires should be supported near the outlets by knobs.

If flush switches are to be used, the better way is to arrange for them by placing iron boxes for them at the outlets. If the boxes are not used, holes can be cut in the board at the outlet, either square or round, according to the kind of switch that is to be used, and the switch afterward fastened to the board. If boxes are used, they should be put up with a level, and great care should be used in fixing up the switches afterward, to make them exactly level. There is no feature of electric wiring where poor workmanship is so frequently apparent as through flush switch plates out of plumb.

In putting up the switches, the wires should be drawn up perfectly tight, and care should be taken not to have them twisted, or so that they can come in contact with each other.

For fixture wiring it is better always to use rubber-covered wire, and nothing smaller than No. 14 should be employed, although lamp cord is frequently used for this purpose.

In wiring a fixture care should be taken not to abrade the wires in drawing them in. The wires in all fixtures having more than one light should be carefully spliced, soldered and taped, and every joint of the gas fixture should be carefully put together with lead. Where simple electric fixtures are used, of course, a crow's foot is necessary. For all combination fixtures an insulating joint should be used, and the unions should be put together with lead. In doing this the lead should not be put into the joint or sleeve, but it should be carefully put on the threads of the pipe so that it will be impossible for any of it to squeeze down into the pipe itself. Before the fixture is put up, the wires should be tested to see that none of them touch the pipe, and the pipes should be tested to be sure that they are air and gas tight.

power generated at a central point must be distributed throughout the ship. For this purpose there can be used either steam, hydraulics, compressed air or electricity. Hydraulics and compressed air not only have a low efficiency of conversion (from steam), but it is difficult to prevent leaks, freezing, bursting of pipes, etc. They have both been tried to a limited extent and both found wanting in service. This leaves steam and electricity as the two remaining systems of distribution from which to choose.

Electricity Direct from Coal.²

By A. J. ROGERS.

All who have thought of this subject at all recognize how important it would be to have a carbon battery, where carbon is consumed, instead of zinc or other metal, and where the oxidizing agent shall be oxygen of the air, or other cheap and abundant material that will directly or indirectly act upon carbon in some suitable electrolyte.

We all know how wasteful the steam engine is of energy. In the best equipped stations, where the steam engine furnishes large amounts of power, the minimum quantity of coal used per horse power hour is from four to 4½ pounds, while in smaller plants from 10 to 15 pounds are consumed, although the theoretical amount should be about .175 pound.

Engineers tell us that the steam engine is nearly to the limit of its possibilities for improvement. But

and three amperes was given by one cell. In attempting to verify these results I could obtain only from .1 to .2 of a volt, and this did not materially change by the addition of a blast of air. The same voltage can be obtained even when the carbon rod touches the bottom of the iron pot, seeming to indicate thermo-electric rather than electro-chemical action.

In June, 1894, Professor Ostwald proposed an ideal CO consuming cell. He proposed the use of an outer copper containing vessel, which should serve as anode. Within this vessel was a porous cup containing the carbon cathode with lumps of carbon. Surrounding the porous cup was a saturated solution of Cu_2Cl_2 and a constant supply of CO, forced into the solution that would be absorbed by it. A stream of air was also supplied to the cathode compartment.

Following out this line of investigation, Dr. Borchers, some five years ago, undertook a series of experiments, using CO and air in an electrolyte of Cu_2Cl_2 , which really absorbs CO and O.

Since the heat energy of CO with O is 75 per cent. of the total energy of the carbon with oxygen, if the two gases can be caused to combine, either directly or indirectly, setting free electrical energy instead of heat, a tremendous step would be gained.

Borchers thought he had accomplished the desired result. He claimed to obtain as high as 27 per cent. of the calculated energy of combination

similar results, except that the electromotive force would more rapidly diminish, probably from decreased internal resistance.

The direction of the current was from the CO charged plate, through the external circuit to the O or air plate. To what extent, if at all, the Cu_2Cl_2 acts as a conveyor of CO to O, I think still a matter of doubt.

As early as 1883 Carl Hering and Dabrowsky report having obtained considerable current with carbon electrodes, H_2SO_4 as an electrolyte, and coal gas brought in contact with one plate and air with the other.

As an aid and a guide to experimental investigation, it would seem to be desirable to determine if the element C can exist in an electrolyte in the ionic state.

With this end in view, Dr. Alfred Koehne, in a paper before the Physical society of Berlin, on February 14, 1896, attempted to show that coal does form ions, and therefore it is theoretically possible to oxidize carbon at ordinary temperatures and obtain electrical energy instead of heat.

He used pure coal as anode, hot H_2SO_4 as electrolyte and Pt as cathode. The liquid became yellow, then dark brown and black, and a thin layer of graphite was deposited on the cathode.

Using C and PbO_2 as electrodes and hot H_2SO_4 as electrolyte, he obtained a galvanic cell, giving an electromotive force of one volt on a resistance of 100 ohms.

Bartoli and Pasogli had previously found that using H_2SO_4 as an electrolyte and carbon electrodes, CO, CO_2 and O formed at the anode.

Koehne obtained 70 per cent. CO_2 , 29 per cent. CO and one per cent. O.

In the *Zeitschrift für Electrochemie* for 1896 (Vol. 2, p. 581), Franz Vogel thinks that Koehne did not obtain carbon in solution, and he thinks the carbon deposited was of mechanical origin and not electro-chemical. So it is perhaps hardly yet proven that carbon does form from free ions in electrolytes at ordinary temperatures. If it does not, the field for investigation in this direction would not seem promising of great practical results.

Within the last two years experimenters have returned again to the fused electrolyte for the carbon-consuming cell.

W. W. Jacques of Newton, Mass., employs fused NaHO as the electrolyte contained in an iron melting pot. This vessel also serves as an electrode. Air is admitted at the bottom of the iron vessel and mixes with the electrolyte and comes in contact with the carbon electrode suspended in the liquid. CO passes off through an opening in the top of the iron tank.

To produce fusion the NaHO is heated to 400° to 500°, MnO_2 and MgO added, and MgCO_3 forms and decomposes, so that only a small amount of the oxide is necessary. Jacques states that he used 100 cells, each 30 centimeters deep and 36 centimeters diameter, and obtained a current of 18 amperes at 30 volts for 18¾ hours with a consumption of eight pounds of carbon.

In another experiment he reports that with 100 cells he obtained 90 volts and 16 amperes, giving him an efficiency of 85 per cent. of the energy of the carbon consumed.

C. J. Reed says the process is electro-thermic and not electrolytic. He finds that illuminating gas will also produce the same effect as air. He also finds that the carbon may be replaced by a metal and that the polarity changes at a red heat.

Without having carried these experiments to the same extent as reported by Jacques, I nevertheless, have been able to get only a maximum of about .3 of a volt electromotive force with an iron containing vessel and electrode, and I question his results, even though they are reported to be supported by the authority of Professors Cross and Rowland.

Employing a Pt crucible instead of iron as the containing vessel and electrode, I find an electromotive force of nearly .5 volt at a red heat of the NaHO.

According to a United States patent issued to Blumenberg nearly a year ago, superheated steam is injected into the fused electrolyte, consisting of CaO , NaHO and eryolyte. He claims these oxides give up a part of their oxygen to the carbon electrode, forming CO and CO_2 , and then receive back their oxygen from the steam, setting free hydrogen. If this is the end of the process, it would hardly seem probable that heat or electrical energy would be liberated.

While the problem of obtaining electricity from carbon direct has not yet received a practical solution, it cannot yet be regarded as insoluble.

The chance for success, however, would seem much better in endeavoring to oxidize the easily obtained hydro-carbons and CO.

We are chasing no "will-of-the-wisp" in working upon this interesting and far-reaching problem. What is necessary is to discover the right conditions.

If we keep closely to the theory of the galvanic cell, as worked out by Nernst and others, we cannot get far astray and are likely to reach valuable results in the solution of this greatest of technical problems.

If any approach to 100 per cent. of the energy of the coal can be secured, an industrial revolution would follow, in comparison with which the invention and perfection of the steam engine is almost insignificant.

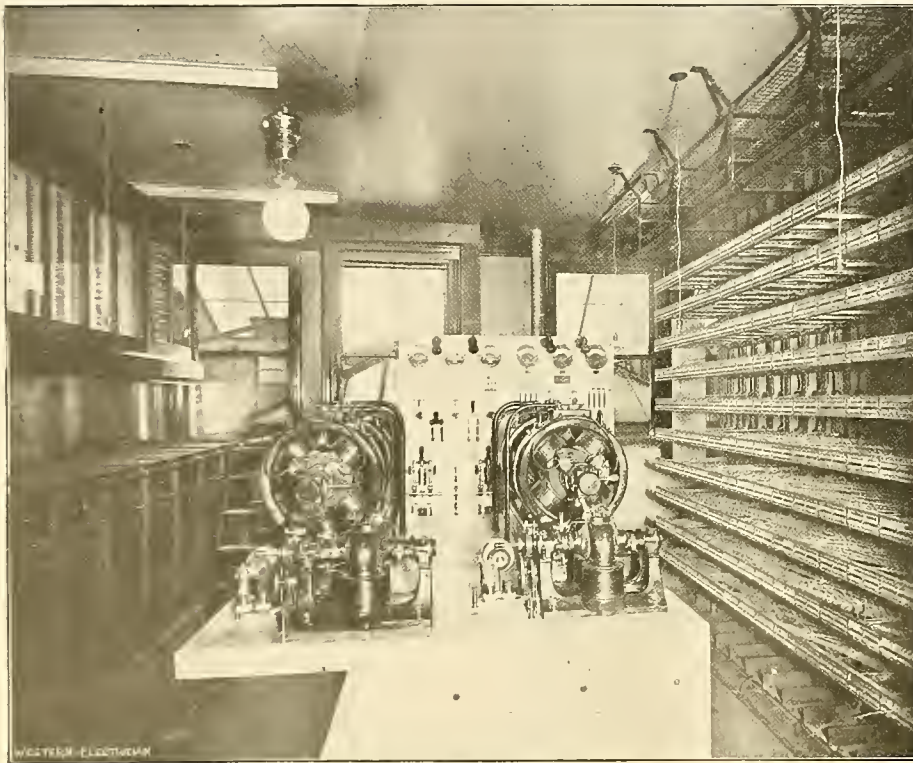


FIG. 6. TWO NEW TELEPHONE EXCHANGES IN CHICAGO,—GENERATING PLANT AT "CENTRAL," WITH DISTRIBUTING BOARD ON THE RIGHT.

how imperfect a machine it is and must continue to be if in practice only five to 10 per cent. of the energy given by the coal can be realized in actual mechanical work.

It is hence well worth the attention of investigators and practical men to make earnest endeavor to explore this field of scientific research to determine what conditions, if possible, are necessary to change carbon into electrical energy instead of first transforming into heat.

Earlier attempts were made to get a practical carbon battery using a rod of carbon dipping into a vessel of molten KNO_3 or other powerful oxidizing agent.

As early as 1855 Becquerel had used various molten electrolytes with carbon as one electrode and a platinum containing vessel and electrode. In 1877 Jablockhoff procured a patent on the use of a solid electrolyte in a state of fusion which would set upon a carbon electrode. Thompson, Edison and others proposed practically the same method. In 1882 J. A. Davis proposed to infuse air into the electrolyte, and in 1883 A. M. Clarke used KHO or NaHO and regenerated with air. I believe Rowland states that in his experiments with the process there is no regeneration.

The cell of C. S. Bradley, described by Professor F. B. Crocker in a paper before the American Institute of Electrical Engineers in 1888, has a fused electrolyte of Na, MnO_2 contained in an iron vessel having as the negative electrode, and a carbon rod dipping to near the bottom of the liquid mass as the other electrode. With the iron pot at a red heat it is stated that an electromotive force of one

1. Borchers' experience with hydraulic turret machinery.
2. Read before the Northwestern Electrical Association at Milwaukee, January 13, 1899.

of $\text{CO} + \text{O}$ to form CO_2 , and with gas from bituminous coal he obtained as high as .64 ampere on short-circuit and .56 volt on high resistance with his apparatus, giving him an efficiency of 38 per cent. Many experimenters, including C. J. Reed in this country, H. H. Barnes and E. Vesemmyer of Stuttgart, Rhodin of Manchester, England, Robert Mond, William Tatlow and others, have repeated Borchers' experiments, varying the conditions, and criticize his results. They consider that the electromotive force is due, not to the union of CO with O, but rather as the result of the oxidation of the Cu of the Cu_2Cl_2 .

In July, 1897, Borchers read a paper before the Electrical society of Germany, in which he claimed that he had eliminated all sources of error in his coal element.

By the use of glass plates instead of porous diaphragms, he separated the Cu_2Cl_2 and CuCl_2 , and prevents diffusion. These glass plates extend into Hg, covering the bottom of the cell. The electrodes are made to revolve in the CO and in the Cu_2Cl_2 , to absorb the CO in the best possible manner. By using plates of the PbO_2 or MnO_2 instead of metal, he obtained an electromotive force of .5 volt.

Since it is still questioned whether Borchers' experiments are conclusive that an electromotive force is possible with CO and O, I strongly heated two like plates of carbon in an oven, then immersed one of the plates and allowed it to cool in an atmosphere of CO and the other to remain in air. After cooling they were partially immersed in a vessel of ordinary lake water, and the electromotive force noted was as high as .4 volt. The experiment was also repeated, using a dilute solution of H_2SO_4 , with

Typewriting by Telegraph.

The accompanying diagram illustrates the principal features of the electrical selective apparatus invented by John S. Thompson of Chicago, who claims to have solved the problem of successfully controlling the action of any one of a series of devices from a distant point by means of a single electrical circuit. Mr. Thompson connects in parallel as many electromagnets as there are devices or characters to be selectively operated—if a typewriter, one magnet to each typebar or lever. These electromagnets vary in construction throughout the series, their cores being given successively a larger number of turns of the same size of wire, or the same number of turns of successively smaller wire, either arrangement resulting in magnets requiring electric currents of different sizes or strengths to energize them. The magnets having the greater number of turns, and, therefore, responding to the smaller currents, require relatively long periods of time for their actuation.

By suitable cut-outs the actuation of any one of this series of magnets simultaneously breaks the circuit at a point immediately beyond itself, thus cutting out all the slower magnets before they have had time to become energized and attracting their armatures. Another feature is that the breaking of the circuit by the actuation of any one of the magnets simultaneously throws into circuit a resistance equal to that of all the devices so cut out, thus maintaining the resistance of the entire series substantially uniform. To operate, then, any one of a series of devices, it is only necessary to develop in the transmitting circuit the current necessary to energize the magnet associated with that particular device. The current sent over the circuit by the depression of a certain key, for example, will divide itself among the electromagnets at the receiving point, and if insufficient to energize the nearest and most quickly acting magnets, it will pass without affecting them and, energizing the magnet adapted to it, cause it to attract its armature and break the circuit, cutting out the slower magnets before they have time to act, and thus secure individual selection.

The principal application of this invention will be in meeting the demand for better, cheaper and more rapid transmission of telegraphic messages. Secrecy, so highly desirable in telegraphy, is assured, the ticking of the sounder being eliminated and the actuation of the relays in the circuit or the typebars at receiving stations, telling no audible tale of the message being transmitted. Moreover, as the receiving is entirely automatic, the liability of error is reduced to a minimum and an exact copy of the message as sent is retained at the transmitting station, the typewriter being capable of use, both as a receiving and sending instrument.

The possibilities of this invention are not limited to this application. In party-line telephony, annunciators, signals, typesetting machines and other kindred devices it will find its field of greatest usefulness.

Mr. Thompson was assisted materially in his work by A. Miller Belfield of Chicago, whose experience in electrical work and as a patent expert proved valuable to the inventor.

New Scheme to Utilize Wave Power.

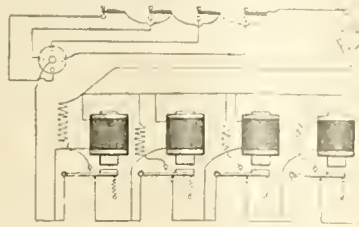
The possibility of utilizing the power of the waves and tides of the ocean to perform useful work has long been an enticing one to inventors, and many attempts have been made to "harness" the mighty forces of the deep. One of the inventors who has attacked the problem is Herbert E. Rider of New York, and the Ocean Power company, with a capital of \$5,000,000, has been organized to commercially exploit his ideas and appliances. It is claimed that \$50,000 has been spent in perfecting the invention. An experimental station has been erected at Galilee, N. J., on the sea coast. This plant, Mr. Rider says, is equipped with engine, dynamo, piping, regulating devices and other machinery with which to convert the power of the waves into electricity. The idea is to utilize a volume of air under low pressure by the use of various buoys working independently by the rise and fall of the waves, compressing a volume of air under low pressure into a large receiver or reservoir, from which it can be drawn off in volume under low pressure to run engines with specially constructed large cylinders. It is said that a small experimental buoy, anchored about 700 feet off shore, has worked effectively in forcing compressed air through iron pipe one-fourth of an inch in diameter. This buoy, it is declared, worked accurately throughout a number of severe storms along the coast, and the only effect of the rough weather upon it was to cause it to compress a larger quantity of air. Three large buoys are now in the course of construction, and it is asserted that a large plant will be built at Rockaway Beach.

Nassau Company Fined \$1,825.

The amount of the fine taxed against the Nassau Electric Railroad company of Brooklyn last month by Judge Laconbe of New York was \$1,825. It was imposed for contempt of court in continuing to use, after restraining injunction had issued, electric motors attached to car trucks in such a manner as to infringe patent No. 324,892, granted to F. J. Sprague. The preliminary injunction was granted June 20, 1898, at the instance of the General Electric company. The Nassau company was fined \$25 each for 73 offending cars.

Carbon Duty Assessed at Twenty Per Cent.

The United States Treasury Department has been informed that the government's appeals in the cases of United States versus Hugo Reisinger and the United States versus Dingelstedt & Co., and Dingelstedt & Co. versus the United States, have been decided in the United States Circuit Court of Appeals for the Second Circuit adversely to the government.



TYPEWRITING BY TELEGRAPH.

The merchandise involved in these suits consisted of arc-light carbons, imported under the provisions of the tariff act of August 28, 1894, and classified for duty under paragraph 86 of that act, under the enumeration for "all articles composed of earthen or mineral substances, including lava tips for burners, not specially provided for, * * * not decorated," at 30 per cent. ad valorem. The importers protested, claiming the merchandise to be properly dutiable at 20 per cent. ad valorem as a "non-enumerated manufactured article," under section 3 of the act. This claim was sustained by the United States Circuit Court for the Southern District of New York on the original trial of these cases, and the appeals have been decided, as above stated, upholding the 20 per cent. interpretation.

Ice Palace at Niagara Falls.

The electric roads in and about Niagara Falls have had their winter business materially increased by the travel to see the ice scenery. In addition to the natural scenery there is an "ice palace," which stands on the riverway, immediately opposite Prospect Park and near the end of the upper steel arch bridge. When the palace was first started warm weather set in and ruined that part of the structure then



ICE PALACE AT NIAGARA FALLS

completed. Nothing daunted, the promoters of the enterprise set to work to rebuild the palace and carry out their original idea. Ice became scarce and it was necessary to call on Buffalo and St. Catharines, Ont., for a supply, so that the palace as it was finished was not fully up to the original plans. An enclosure within a fence of ice is used as a skating rink. Electricity was brought into service to light the palace. A picture, entitled "Mischievous Brewing," is lighted and transformed by incandescent lights. There is an electric shield 11 feet high and a waving flag. There is also a windmill made of small incandescent lights. On the upper steel arch bridge a large searchlight is in operation, and its beams on the ice interest all. Under this light the ice palace is very pretty.

The California Legislature is considering a bill appropriating \$13,000 for an electric-light plant in the Yosemite Valley.

Combination of Chicago Street-railway Companies.

Mr. Yerkes has publicly announced his plan in favor of the combination of the Chicago Street-railway Companies on the North and West Sides of Chicago. As he is heavily interested in all of them, his will probably be carried out. The Chicago Tribune asserts that the Chicago Consolidated Traction company has been organized for the purpose, with authorized capital stock of \$15,000,000, and that all the outlying Yerkes roads (not the main North and West Side systems) will be absorbed by it. The company will be incorporated under the general law of the state authorizing a horse and dummy railway business. The names of the companies that are said to be about to enter the combination, with their stocks and bonds, are tabulated thus:

Companies.	Capital.	Bonds.
North Chicago Electric Railway Co.	\$ 2,000,000	\$ 700,000
Cicero and Proviso Street Railway Co.	2,000,000	1,000,000
Chicago North Shore Street Railway Co.	6,000,000	800,000
Chicago Electric Transit Co.	1,500,000	1,000,000
North Side Electric Street Railway Co.	1,500,000	150,000
Suburban Railroad Co.	1,200,000	2,000,000
Evanston Electric Railway Co.	1,000,000	1,000,000
Chicago and Jefferson Urban Transit Co.	2,400,000	250,000
Ogden Street Railroad Co.	1,500,000	175,000
Totals.	\$15,000,000	\$8,000,000

St. Anthony Falls Power Plant.

The equipment of the power house at the lower dam of the Falls of St. Anthony at Minneapolis, Minn., is about to be completed, and the necessary arrangements have been made by the St. Anthony Falls Power company with the General Electric company, which manufactured and installed the plant now in operation. The hydraulic work and the power house were finished in the spring of 1898, and five three-phase alternators of 700 kilowatts each and two direct-current generators of the same capacity, with the necessary rotary converters and static transformers, were installed. The full equipment of this power plant as originally laid down contemplated the use of eight alternators and two direct-current machines of the total capacity of 10,000 horse power. The present plant has been in full operation since May of last year, the current being used to drive the street and interurban railway systems of the Twin Cities Rapid Transit company, which operates the electrical railways of Minneapolis and St. Paul. The additional equipment will consist of three 700-kilowatt, three-phase, revolving-armature alternators, with rotary converter,

step-up and step-down air-blast transformers and switchboards for the generators and converter. The installation of this machinery will increase the generating capacity to the 10,000 horse power originally contemplated.

Line Material on Mexican Free List.

On March 1st there will pass into effect a revised Mexican tariff in which have been made several changes, and among them one of especial interest to electrical men. Under the present reading of the tariff there is only a provision for free entry of poles, cross-arms and spikes of wood for telegraph and telephone lines. This has been changed so that the paragraph will now read "poles, cross-arms and spikes of wood for the stringing of electrical wires," and this will also include the poles, etc. for electric railroads, which have heretofore been excluded from the privilege of free importation. This was accorded to the first mentioned articles.



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view of determining whether transmitters are the means of spreading disease. The inspectors will be provided with a quantity of absorbent cotton, with which they will thoroughly clean the transmitters and receivers.

President McKinley has sent a special message to Congress urging that body to recognize the importance of the subject of laying a telegraph cable in the Pacific, connecting the island possessions of this country with the seat of government, and take immediate action upon the plans already before it.

An interview published in the daily papers represents Mr. Scrymser as taking a gloomy view of the situation. He says existing cable companies enjoy a monopoly of the telegraph business in the Philippines, and all Asiatic connections are under their control.

Liability for injuries sustained by workmen in the discharge of their duties has proved a subject of legal contention in every department of industry, and many fine distinctions have been made by the courts, especially in electrical cases.

A man employed in the work of substituting iron poles for wooden trolley poles that had become rotten was injured by the breaking of one of the old poles. He sued for damages and got a verdict in his favor, but the Supreme Court of Minnesota reversed the judgment of the lower court, and, in its opinion, says the old wooden pole was not, as the man's counsel contended, an instrumentality furnished by the master for the purpose of raising the iron pole, and of such a character that the master was liable for failure to repair that instrumentality.

Street-railway legislation for Chicago is confidently anticipated by the management of this class of properties and by the representatives of the anti-Allen law movement. It is announced that a bill has been prepared which will provide for an extension of franchises for 25 years and a lower fare for those who purchase tickets.

empowered to draw the ordinance, fix the terms and make the contract, leaving nothing for the council to do but either ratify or reject its work. It will provide that the company seeking an extension must file its petition with the commission three years before the expiration of its franchise, and that the commission must place an ordinance before the council within one year thereafter.

Platinum has been discovered in the Yukon district, and, should the first indications be confirmed by more thorough investigations, the wealth of the region will be increased materially and the market for the metal correspondingly affected. It is explained that the black sand which is found in almost every stream in the Yukon territory, and which has heretofore been considered a nuisance to washers, although an indication of the presence of gold, has been thrown away as a worthless by-product.

At the outset it was ascertained that 25 per cent. of the black sand was not magnetic iron oxide, and the two grades were carefully separated. The magnetic sand was subjected to furnace tests under varying conditions, and, at the proper heat, it was found that all but the metals wanted were volatilized or converted into slag, leaving buttons of platinum and gold. One ton of black sand contained 96 ounces of platinum and considerable gold, in addition to the placer gold caught in the sluices and upon the amalgam.

Forty cubic feet of gravel in place gave 12 pounds of black sand by the usual lixiviation process. This black sand, assayed and analyzed, gave a high value in gold and platinum, with traces of silver, copper, tin and iridium. The sample, when analyzed for platinum, gave the enormous amount of 96 ounces to the ton, the platinum being the shape of finely divided minute grains of metal, combined with similar sized grains of excessively fine gold, to the value of \$102 to the ton.

Very little platinum is produced in this country, the total output in 1897, according to the government statistics, being 150 ounces, worth in the crude state \$900. During the last few years there has been a systematic search made for platinum throughout the United States, Canada, Alaska and South America, but nothing was discovered as promising as the reports from Dawson City. Most of the platinum used in this country comes from Russia, the average production of late years being 175,000 ounces and the average price \$11 per ounce.

The New York Board of Health has taken official notice of the fact that disease germs are propagated and distributed through the agency of the telephone. It has accordingly ordered inspectors to make an examination of the public telephones, more especially those which are extensively used, with the

Dr. Rowland's Printing Telegraph Machine.

For a long time Dr. Henry A. Rowland, the eminent physicist of Johns Hopkins University, has been at work on an invention designed as an improvement in the art of telegraphy by sending several messages over one wire, both ways, at once.

Professor Rowland and those interested with him in the machine are convinced that it will completely revolutionize the art of telegraphy. The advantages claimed for the Rowland printing-telegraph machine, as given in the Chicago Tribune, are that it enables several messages to be sent and received together and at the same time from the same or separate points over the same wire; that it makes it impossible to "tap" a wire and catch any one or more of the passing messages, and that it will not be affected by the weather.

The operation of the instrument may be most readily understood by beginning with a consideration of any part of the mechanism situated at the sending station. The sending instruments are fitted with a keyboard, like typewriters. Their numbers are the same as that of the messages that it may be desirable to send simultaneously. Light is the regular number of messages that the instrument is designed to handle at once, but it could be taken without special inconvenience. Each keyboard must have a person to operate it; the economy in labor is experienced at the receiving end of the line. Still considering the sending instrument, and supposing all eight of the keyboards—it matters not how widely separated—to be in use, the operators rattle ahead with their messages as rapidly as they choose and without regard to one another.

It would seem as though the eight dispatches, switched on to a single wire, would produce hopeless confusion, but one of the devices of Professor Rowland's instrument adjusts the words in such a way that the separate letters of the respective messages cannot start on the main wire out of their regular turn.

For example, suppose the first words of six sentences, started simultaneously, to be respectively "Wheat," "The," "Jarvis," "Yonkers," "League" and "Armenian," the adjuster would select in turn the letters W, T, J, Y, L, A, h, h, a, o, e, r, etc., the order of rotation being constantly preserved.

So long as the message-sending capacity of the instrument is not exceeded it makes no difference whether the messages all be sent in one direction or part of them in one direction and part in the contrary. The adjuster will accomplish its work as well with four messages going north and four coming south or one going north and five coming south as it will with the whole group of messages proceeding in the same direction. This result is made possible by the nature of the alternating current.

At the receiving station the Rowland receiver performs its work without human aid. The eight messages are automatically separated and distributed to the instruments. These print out the messages as fast as received. At present Dr. Rowland's instruments are fitted to print on ribbons of paper, such as is used in the familiar "ticker," but his perfect machine will print the messages out on sheets of paper of any desirable shape and size. Hitherto there never has been a successful attempt to attain this result.

The only attention necessary at the receiving station is to supply the instrument with paper and take away the printed sheets.

The receiving instrument has the appearance of complication, but Professor Rowland says that it is not apt to get out of order.

Incidental to his work on the "multiplex printing telegraph," as the above-described instrument is called, Professor Rowland is developing a "sex-tuplex" instrument, to send and receive messages by the Morse system. Except that it will not print its messages, this instrument will have substantially the same advantages as the printing telegraph. It will do the same work in the way of sending several simultaneous messages in either or both directions on the same wire, but will require an operator, of course, at every instrument. It is this instrument that Professor Rowland hopes to make popular in this country.

A second incidental to the experiments leading up to the "multiplex" has been the partial development of a receiving instrument that will print two messages at the same time. This result will be accomplished by a single set of type.

Electrical Development in Nicaragua.

In Nicaragua a system of telegraph lines about 1,800 miles in length has already been established. The wires and telegraph instruments used are American products. There is another telegraph line to San Juan del Norte and one to Bluefields on the Atlantic coast. The principal cities along the railway are connected by telephone, the line being about 200 miles long; the wire used is hard-drawn copper wire. The apparatus used is the French Roulet and the American Hunnings transmitter.

Electric plants are used in Managua, the Nicaragua sugar estates of San Antonio, the Barillas coffee estate, Santa Francisca mining syndicate and the

Rodriguez sugar estate. The dynamos used in the plant at Managua were furnished by a New York concern; those of Rodriguez and Barillas are of American origin, while the lighting apparatus for the Santa Francisca mines and the San Antonio sugar refinery are of English manufacture.

A plan is under consideration now to use the water power of the Lake of Nicaragua for electric light purposes. This can be achieved by cutting a canal one mile long from the lake to the town of Tipitapa. By this canal a waterfall of 15 feet will be made available throughout the year, the force of which will feed three-phase alternating current generators of 300 kilowatts' capacity, that would furnish 245 arc lights of 2,000 candle power and 3,000 incandescent lamps of 16 candle power, to be distributed among the towns of Managua, Masaya and Granada. The motive power obtained in daytime would equal 300 horse power at the end of the lines. The cost of this plant is estimated at about \$150,000 gold, including buildings.

Innovation in Incandescent Lighting.

Professor Walther Nernst of Göttingen University has invented a new electric lamp which he claims reduces the cost of incandescent electric lighting by half. The new lamp needs no glass bulb and burns with a filament much less fragile than the carbon ones used in the ordinary incandescent lamps.

Nernst's lamp has been in operation at the Society of Arts, London. James Swinburne, who is the inventor's representative, explaining the advantages of the lamp, said:

"First, this lamp needs no enclosing. It burns in the open air. The filament is essentially a thin rod of highly refractory oxides, which, as it will not convey the electric current at an ordinary temperature, has to be heated to a dull red heat before the electric current will flow. This heat can be produced by a match or spirit lamp or other device. Once the rod reaches the desired temperature it becomes a white light, giving a light that is as near sunlight in quality as possible. The lamps can be made all sizes and utilized for street purposes, giving a light less dazzling but more steady than the arc lamp. It is vastly superior to the gas lamp. The invention is of recent date, but already lamps are made to last 500 hours, as against 1,000 of the usual incandescent lamp. It requires less than one-half the quantity of electrical energy, and, compared light for light with existing incandescent lamps, the consumer will benefit largely by its introduction."

London correspondents say that electrical experts present at the demonstration admitted the excellence and illuminating power of Nernst's lamp, and the meter showed that the inventor's claim as to its economic properties was scarcely exaggerated, but the general opinion prevailed that the necessity of using other artificial light to start the lamp was a serious defect. Nernst is now engaged in experiments to remove this objection.

It is said the Nernst lamp gives one candle power for the expenditure of 1 1/2 watts of electrical energy.

Death of J. H. Bunnell.

By the death of Jesse H. Bunnell, head of the firm of J. H. Bunnell & Co. of New York, the electrical fraternity of the East loses a well-known figure. Mr. Bunnell, who was born in Massillon, O., in 1832, distinguished himself when a young man as a military telegrapher. He entered the local telegraph office at the early age of 11 and became an expert operator, winning the record for fast sending in 1860. At the outbreak of the war young Bunnell entered the military telegraph service. He was an active participant in some of the most stirring scenes of the Rebellion. He was attached to the Army of the Potomac and the Army of the Cumberland, serving at the headquarters of Generals McClellan, Burnside, Rosecrans, Thomas and Sherman as their personal telegrapher. At the battle of Antietam he set up his office on the field and sent and received messages under fire. He was with General Rosecrans at Chattanooga, and after the flight of the right wing was the last man on the field. He remained on the spot and opened communication with Rosecrans. He rejoined the army at Atlanta, but was so much overcome with the long hardships he had endured that he was unable to accompany Sherman on his march to the sea, and returned to his home in Ohio. All through his perilous service with the army he had distinguished himself for coolness, discretion and bravery.

After the war Mr. Bunnell came to New York and engaged in business, organizing the electrical supply firm to which he belonged about 20 years ago. He died in Brooklyn on February 8th, from weakness following an attack of the grip, leaving a widow, two sons and two daughters.

Electric Railway for Princeton, Ill.

An ordinance is under consideration by the City Council of Princeton, Ill., providing for a franchise for an electric railway that will furnish the people of that city transportation facilities within the city and give them connections with neighboring towns. The term of the franchise is to be 50 years, and the company will be permitted to use its tracks for hauling freight at night, but restrictions will be imposed prohibiting the handling of freight through the principal streets of the city during the day.

The Recent "Spell of Weather."

The exceptionally severe cold weather prevailing along the Atlantic coast by very heavy snows that prevailed in the north and cold temperatures in the United States for the first half of February, has been the resource of many of the electric street-car companies to the amount of a month for work on street-car traffic was at a standstill for hours or even days at a time. The snow and ice on the roads in New York and Washington, D. C., have fared as well as the overhead trolley lines. One Washington correspondent, writing on February 8th, says: "The principal street-car lines of Washington are operated by an underground electric system and have since Sunday been compelled to close on a severe snowstorm as Washington has known in years. More than 14 inches of snow has fallen, and it is still on the street, but the cars have for a time furnished an uninterrupted service. Later, however, as the depth of snow steadily increased, the companies operating the lines with underground contact wires were forced to discontinue the running of trains.

Fortunately, the snow was dry and fine and did not attach itself to any great extent to the overhead wires. Therefore, the operation of the telegraph and telephone lines was not greatly interfered with.

In Chicago, for two weeks, the temperature ranged from five to 20 degrees below zero nearly all the time, and great difficulty was experienced in heating the cars. The heat of the coal stoves in the surface cars was felt only by those who could huddle over them. In the elevated trains the electric heaters, distributed throughout the cars, were somewhat more efficient; but the trouble was that the companies were not prepared to spare enough current from the driving motors to heat the cars properly. There was insufficient generating capacity at the stations to move and light the trains and at the same time supply the enormous heating current demanded.

Government Electrical Work.

[Special correspondence of the WESTERN ELECTRICIAN.]

WASHINGTON, February 13.—The secretary of war has asked for an appropriation of \$9,851.24 for restoring the power house, machinery and electric plant at the Rock Island arsenal, which were destroyed by fire on January 3d. On account of this fire it is necessary to run a large part of the plant by steam instead of water power, at a greatly increased cost of manufacture. The estimated cost of replacing the electric plant is \$2,000, and, in the interest of economy, the secretary asks that the appropriation, if practicable, should be made immediately available.

The Treasury Department is inviting sealed proposals, until February 21st, for the installation of a system of conduits and wiring for electric lighting in the United States Postoffice building at South Omaha, Neb. Plans and specifications can be had upon application to O. L. Spaulding, assistant secretary, Washington, D. C.

The Bureau of Supplies and Accounts of the Navy Department has invited proposals for furnishing the New York navy yard with the following electrical supplies: Four testing generators, 50,000 ohms; four portable, direct-reading voltmeters, scale, 0 to 125; four hand tachometers; four hand speed-indicators; eight engine indicators; 694 80-volt lamps of 16 candle power, and 48 of 32 candle power; several thousand feet of single and double-conductor wire; several thousand feet enamel conduit; insulating outlet elbows, ceiling fixtures, reflectors, side lights and desk lights.

Sealed proposals have been invited by the Treasury Department for the installation of a system of conduits and wiring for electric lighting in the United States public buildings at Pottsville, Pa., Akron, Ohio, and St. Albans, Vt. A. F. T.

President's Cable Message.

President McKinley's message on the Pacific cable, transmitted to Congress February 10th, is as follows:

As a consequence of the ratification of the treaty of Paris by the Senate of the United States and its expected ratification by the Spanish government, the United States will come into possession of the Philippine Islands, in the further States of the Pacific. The Hawaiian Islands and Guam being United States territory and forming convenient stopping places on the way across the sea, the necessity for speedy cable communication between the United States and all the Pacific Islands has become imperative.

Such communication should be established in such a way as to be wholly under the control of the United States, whether in time of peace or war. At present the Philippines can be reached only by cables which pass through many foreign countries, and the Hawaiian Islands and Guam, especially being surrounded by steamers, involving delay and expense, it is greatly to be regretted that the present conditions should not be allowed to continue for a moment longer than is absolutely necessary.

The time has now arrived when a cable in the Pacific may extend as far as Manila through the Hawaiian Islands and Guam on the way. Two methods of establishing the cable communication are suggested. First, the establishment and maintenance of such a cable at the expense of the United States government, and second, the establishment of such a cable by a private United States corporation, the charter to be granted as Congress shall decide.

I do not make any recommendation. I believe that these methods would be equally desirable. A cable of the length of that proposed requires a substantial expenditure, and having that in its estimate, at least two or three years after giving the contract for the cable, the government should be successfully laid out in operation. For the reasons soundness must be taken west of the Hawaiian Islands, the best route for the cable in the Pacific is the one that stands it becomes a point of interest that the cable should be taken by the route that is most economical and that means as may be desirable for the establishment of a cable system.

I recommend that the whole subject be referred to the Joint Committee on Commerce and Navigation, and to the Senate and House of Representatives, as a basis for their consideration.

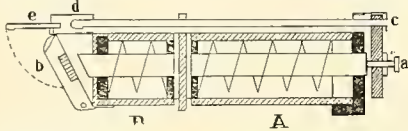
DEVELOPMENT OF THE TELEPHONE FIELD.

Modern Bridging System.¹

By HERBERT LAWS WEBB.

The diagrams shown give a clear idea of the principle of the electrical self-restoring drop and of the circuits of the bridging board. This system was designed by the Western Electric company of Chicago. It marked a great step in advance in telephone-exchange operating, and has been extensively adopted all over the world. The principal features of the system, as already stated, are a balanced metallic circuit, absolutely free from jack contacts, for the line, an entirely separate test circuit and an automatic resetting of both line and clearing-out drops.

The self-restoring drop is of the same pattern for both line and clearing-out drop. It consists of two separate electromagnets operating on two distinct armatures. *A* is the line coil, wound to a high resistance, usually 600 ohms, as it is bridged permanently across the line. *B* is the restoring coil of low resistance, which is included in the test circuit and is energized by the test battery. When *A* is energized by the line current the armature *a* is



Self-restoring drop. *A*, line coil; *B*, restoring coil; *a*, armature; *c*, *d*, releasing lever attached to *a* and engaging in *b*; *b*, drop bearing; *r*, aluminum shutter covering *b* when *b* is in normal position.

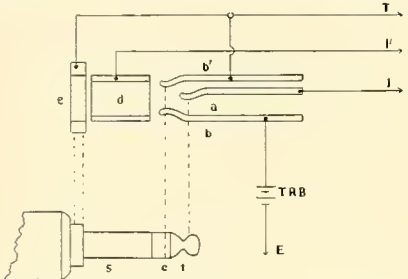


Diagram of spring-jack and plug of bridging board. *a*, line spring; *t*, tip of plug; *b*, *b'*, test springs; *c*, collar on plug making contact between *b* and *b'* and so throwing *TRB*, test and restoring battery, in circuit with test wire and restoring coil of drop; *d*, barrel of jack connected to second line wire; *s*, sleeve of plug, making contact with *d*; *e*, rim of jack connected to test wire; *T*, line wires; *T*, test wire.

MODERN BRIDGING SYSTEM.

attracted and the drop-shutter *b*, normally held by the tip *d* of the armature lever *cd*, is allowed to fall forward; *b* only falls forward a short distance, but in falling it pushes outward and upward a light shutter *e*, pivoted at the top, which normally hangs over *b*. The drop number is painted on the face of *b*; a very slight movement outward of *b* pushes *e* out and up, allowing the number on *b* to come into full view, and a very slight movement back allows *e* to fall back and completely cover the number on *b*. The back of *b* is hollowed out to fit the pole of the restoring-coil, which has an oblique pole-piece, so as to get as strong a pull as possible on *b*. When the insertion of the plug closes the test circuit the restoring coil *B* is energized, *b* is attracted and brought to its normal upright position and *e* falls, covering the number. As the test circuit is closed as long as the connection is up the drop is locked by the attraction of *B* on *b* during the time the plug is in the jack.

The diagram of the plug and jack shows that the jack consists of one short spring, *a*, to which one side of the line is connected, two long springs, which form a break in the test circuit, containing the test battery and the restoring-coil of the drop, a barrel *d*, to which the other side of the line is connected and a rim *e*, which is branched in the test circuit. The plug consists of three parts: a tip *t*, to which one conductor of the cord is connected, a sleeve *s*, to which the other cord is connected, and a collar *c*, which is insulated from the rest of the plug. When the plug is inserted in the jack *s* makes contact with *d* and *t* with *a*, thus bridging in on the line, while *c* makes a metallic bridge between *b* and *b'*, and so closes the test circuit. The wires marked *T*, *I* and *F* go to the other jacks in the series; the drop and restoring coil are not shown. The line drop is bridged across *I* and *F*, and the restoring-coil is included in the test circuit between *T* and *E*.

The bridging system, as will be seen from the foregoing description, not only cuts down the number of operations in each connection, but materially improves both the electrical conditions of the lines and the mechanical arrangement of the switchboard. The provision of a balanced circuit throughout the board and the elimination of the jack contacts remove the worst features of the series-multiple board, while the placing of the automatic drops above the jacks effects a marked gain in the compactness of the manually worked parts of the board, with a resulting improvement in speed and accuracy.

The system now being introduced in this country. Abstract from new edition of "Telephone Handbook" (Electrician Publishing Company, Chicago), now ready.

try which combines all the automatic features referred to (see WESTERN ELECTRICIAN, February 4, 1899) with a fundamental improvement in the subscriber's station is the common-battery relay system. In the relay system the battery is at the central office, and the subscriber's magneto generator and battery are done away with. In the signaling devices at the exchange a relay connected to the line and controlling an incandescent lamp in its local circuit takes the place of the drop. The operation of the board is reduced to the six steps for each connection, referred to above as being the present possible minimum. The subscriber—whose instruments are reduced to a transmitter and receiver, a switch-hook and a call bell—by taking the receiver off the hook operates the relay and lights the lamp corresponding to his number. The operator plugs into the answering jack, and by so doing extinguishes the line signal. Having got the number wanted, the operator plugs into the multiple jack and rings the called subscriber. When the conversation is ended the two subscribers hang up their receivers and the depression of the switch operates a lamp in each cord, which are the disconnection signals. The operator, by removing the plugs, extinguishes the disconnection signals and restores everything to its normal condition. It is not the province of the "Hand-book" to describe in detail an elaborate system, such as the common-battery relay system is. It would take a fair-sized volume to do the subject justice, both in its technical features and in its general bearing on the working of large telephone exchange systems. But, briefly, it may be said that the relay board, with all its adjuncts, produces radical improvements in all directions. It reduces the subscriber's station to the three indispensable elements, call bell, transmitter and receiver, doing away with the vexatious question of battery inspection and renewal. It makes the operation of the connection as nearly automatic as it ever will be made in a large system, and gives the operator easy supervision of the progress of each call, effecting a marked gain in speed and simplicity of operation over previous systems. It provides the most distinct and easily supervised signals that can be had, a lamp being decidedly superior to any form of drop or needle indicator. And, finally, with all these improvements, it preserves the multiple system, which experience shows is still the best for large exchanges, but which was at one time threatened by transfer boards employing automatic lamp signals.

EXTENSIONS AND IMPROVEMENTS.

There is talk of connecting Pala by telephone with San Diego, Cal., and Oceanside.

A trunk line between Flushing and Jamaica, Long Island, is being constructed by the New York and New Jersey Telephone company.

The Fulton (N. Y.) Telephone company will soon connect with Oswego, Phoenix and other points. E. E. Summey of Syracuse is general manager.

A proposition has been made to the Skagway City Council by a Seattle man to put in a telephone line. He asked that a franchise for that purpose be granted him.

C. J. Townsend of Boonville, Mo., will soon build a telephone exchange in that place and extend lines to Pilot Grove and Buncheon. Subscribers will receive free service to Buncheon, Pilot Grove, New Franklin, Fayette, Glasgow, Armstrong, Estill and Boonsboro.

Assistant Superintendent Bush of the Oregon Telephone company states that arrangements have been made for construction early next summer of a telephone line from Roseburg, Ore., to Myrtle Point, via the Middle Fork wagon road. He has let contract for poles.

W. E. Herron of Chicago has purchased the entire plant of the Oak Telephone company of South Haven, Mich. The exchange served 170 subscribers and had connections with all the principal towns in that section and in the outlying farming section between Holland and St. Joseph.

Application has been made to the supervisors at Sacramento, Cal., for a franchise to erect and maintain poles, wires, etc., for telephone and telegraph purposes in Sacramento County. The franchise is now advertised for sale, bids to be received up to 2 p. m., March 11th, by W. B. Hamilton, clerk.

It is believed that the consolidation of the small telephone systems of Connecticut would strengthen the independent movement in that state. In many of the towns and cities there are small exchanges with from 200 to 500 subscribers, and it is now proposed to connect all of these into one system extending throughout the state.

The Union Telephone company of Plainfield, Wis., has made arrangements to extend its line to Stevens Point, a city of 9,000 inhabitants, which is only 23 miles north of Plainfield. This company now has lines from Plainfield to Hancock, Coloma and Wautoma. The owners of the line are B. B. Borden and F. R. Borden of Plainfield and F. C. Wood and M. Plank of Hancock. B. B. Borden is president of the company.

Telephones in Hawaii.¹

By CHARLES L. RHODES.

Nowhere in the world, perhaps, is the telephone a greater factor in life than in Hawaii. In the islands there are about 2,000 telephones to a population of 110,000, or one telephone to every 52 inhabitants. On the island of Oahu, on which Honolulu is situated, there are 1,090 telephones to a population of about 45,000, or about one to each 41 of the population.

The telephone was introduced here in the latter part of 1880 and soon became an established part of the business, social and political life of the country. It may sound strange to use the word "political" in this connection, but it is true in a sober and literal sense, for in every revolution that has been planned or attempted the seizure and control of the central telephone office has always been one of the first strategical moves thought of.

The telephone is much more of a public institution here than it is in most places. Isolated as the islands are, the arrival of a steamship from a foreign land is of personal interest to almost every individual. The government maintains a lookout station on Diamond Head, from which approaching vessels in any direction can be sighted while still from 20 to 40 miles distant, depending on the state of the atmosphere. As soon as a steamer is sighted "central" is notified. "Central" then notifies the pilot office, the port physician, the board of health, the custom house, the postoffice, the newspaper offices and a few other persons who have a particular interest in having early information of this character. Then the electric-light company is notified, and it gives two long whistles if the steamer is from America and three if it is from any other part of the world. For two minutes after these whistles are blown no telephone connections are made, but the force at "central" keeps repeating the name of the steamer and its location, as "Australia off Koko Head," or "China off Waianae." So that all any individual needs to do is to go to the nearest telephone, put the receiver to his ear and listen, and he will know what steamer it is, where it is, and if he has lived here any length of time he can form an accurate judgment as to how long it will be before the steamer will be at the wharf.

If the steamer brings any striking piece of news of general interest, "central" gives it to everybody who calls up for a connection. In this way the destruction of the Maine was known all over this island within 10 minutes after the Zealandia, which brought the news, was at the wharf.

If an important personage dies the news is distributed in the same way, and "central" can always be depended on to give the hour and place of a funeral as soon as the hour has been fixed. In New York and Chicago, if you want to make an inquiry you ask a policeman. In Honolulu you ask "central."

The meatmarkets have a list of their regular customers at "central," and about six o'clock each evening "central" calls them all up in order and takes their orders for the next morning's breakfast.

Liliuokalani, in her book, "Hawaii's Story by Hawaii's Queen," gives a very naive and wholly unconscious illustration of how thoroughly the telephone enters into life here. She says that in 1888 a proposal was made to her for the dethronement of King Kalakaua and her own accession to the throne. She dismissed the messenger with an emphatic rejection of his proposal. The messenger, however, told her she would hear more of it. "In conformity with his words," she continues, "about a week from that day my telephone was rung by Mr. W. R. Castle, who wished to know if I would be at home that morning; if so, he would like to call and see me on an important matter, and would arrive in about half an hour."

On the island of Hawaii, the largest of the group, and, next to Oahu, the most populous, there are about 500 telephones. The telephone company is just completing the circuit of the island, so that every part of it will be in direct communication with every other part. When the news of annexation reached here the first island steamer to leave was bound for an unimportant port on Hawaii. But there was a telephone there, and within a few minutes Hilo, on the other side of the island, had heard the news, and from there it was distributed to every part of the island, and flags were going up at points which did not get mail advices on the subject for days afterward.

The pursers of the steamers Mauna Loa and Kinai are, by reason of the telephone, two of the most important personages in the islands.

The Mauna Loa makes a round trip once in 10 days between Honolulu and the ports on the leeward side of Hawaii. At the first port the steamer touches the purser is besieged with inquiries for the news from the outside world, and from his lips it goes over the telephone to all parts of the island, the statement that it comes from Mortimer Tuft of the Mauna Loa being accepted as the seal of authenticity wherever it goes. On the return trip, at the last port on the island which the steamer touches, he gathers up the thread of happenings, accepts messages to people in Honolulu on every subject from engagements and births to deaths and marriages.

1. From the Chicago Record.

the sale of sugar plantations, or news of an earthquake in the Kau district, so that on arrival here he is the most sought-after man in the city.

The Kinan makes weekly trips to the windward side of Hawaii, and Purser George Beckley alternates with Tuft as oracle and Mercury.

Not long ago there was a wedding on Maui to which nearly every one in good social standing on the island was bidden. It happened that there was a drought at the time, pasturage had become scant and every horse not absolutely needed for regular daily service had been turned out into the mountains to forage for himself. There was therefore a scarcity of horses to take all the guests to the wedding. But by dint of combination and co-operation, arranged over the telephone, every available horse and conveyance was made to meet the fullest requirements of which it was possible, and every guest in a territory 40 miles square knew just how he and every other guest would be conveyed to and from the wedding.

On Kauai, where there are about 200 telephones to a population of about 10,000, a very small proportion of which is white, a stranger is surprised to hear himself accosted by name wherever he goes, and almost from the moment he lands from the steamer. But the secret of it is the telephone. Gossip is busy over the wire from the time his identity is learned from the steamer's cabin list, and before he is through looking after his luggage his name and description, with such observations concerning him, pleasant or unpleasant, as strike the first observer, have gone over the telephone circuit from Nawiliwili to Hanalei.

NEW COMPANIES.

The Montgomery (Mo.) Telephone company has been incorporated with a capital of \$3,000. The incorporators are A. B. Chance, A. E. Kemper, J. W. Jacks and H. S. Jacks.

The Cameron Telephone company of Cameron, Mo. (capital, \$10,000), has been incorporated by E. C. Baker, S. D. Thompson, J. A. Livingston, C. F. Thompson and M. J. Baker.

The Duquoin Telephone company has been incorporated at Duquoin, Ill. (capital stock, \$16,000), to operate a telephone exchange. The incorporators include B. A. Youngblood, F. H. Stamper and H. H. Onstort.

The Trenton Telephone company of Trenton, Mo., has filed incorporation papers. The capital is \$8,000, and the incorporators are P. W. Bain, W. W. Bain, C. J. Bain, J. B. Wright, A. U. Spickhard, B. C. Nichols and E. M. Harber.

The Winchester, Ford and Richmond Telephone company of Winchester, Ky., has been formed to build a telephone line from Winchester to Richmond by way of Ford. S. T. Prewitt, David Prewitt and D. L. Pendleton are the incorporators.

The Fahnestock Transmitter company of New York has been incorporated in West Virginia to manufacture and deal in electrical transmitters. The authorized capital is \$100,000, and the incorporators are G. O. Robbins, Bloomsburg, Pa.; E. B. Fahnestock, N. Chase, J. E. Chessman, W. S. Logan.

The Florida East Coast Telephone company has been organized at Boynton to build and operate a line connecting the towns along the Florida East Coast Railway company's system. The capital stock is \$10,000, and the following-named officers have been elected: President, N. S. Boynton of Boynton; vice-president, G. W. King of Little River; secretary, P. H. Loud, Jr., of Miami; treasurer, M. B. Lyman of Lantana.

A bill has been introduced in the House of Representatives at Washington providing for the incorporation of the Columbia Telephone company, to construct and maintain an underground electric telephone system in the District of Columbia, with all the necessary ducts and conduits, mechanical and electrical devices. The bill provides that it shall be unlawful for the proposed company to charge at any time more than \$50 per annum for its regular service in any business establishment and \$30 for any residence. The incorporators are John D. Langhorne, Orrin G. Staples, John A. Baker, Tallmadge A. Lambert, T. Cushing Daniel, J. E. Keelyn, W. G. Waggaman, W. S. Knox, Lawrence Gardner, J. A. Blundon and Thomas Armat.

The Maryland Telephone company was incorporated at Baltimore, February 6th, with a capital stock of \$1,250,000. Henry A. Parr, George R. Webb, Pinkney W. Wilkinson, Thomas F. McGlone and John Waters are the incorporators. It is the purpose of the promoters to establish a complete plant for 6,000 telephones. At present the company will issue \$1,000,000 of its capital stock and bonds amounting to \$1,000,000. The officers of the company are: President, George R. Webb; vice-president, Seymour Mandelbaum; directors, Henry J. Bowdoin, William H. Bosley, David E. Evans and John Waters. Others interested in the enterprise are the Guardian Trust and Deposit company, Security Storage and Trust company, William F. Stone, Bartlett S. Johnson, George Blakistone, August Berkemeier, Leopold Strouse, William J. Donnelly, James Bond, John J. Mahon, Solomon Frank, Charles Adler, Lloyd L. Jackson, William G. Wetherill, Richard H. Pleasants and F. H. Hambleton.

Michigan Telephone War.

[From the Detroit correspondent of the WESTERN ELECTRICIAN.]

So far the Detroit Telephone company (independent) has not made an open move to counteract the activity of the Bell company in the state telephone war.

Charles H. Seitz, who was recently appointed to the new office of manager of the central district of the state by the Michigan Telephone company, has resigned. It is rumored that he may assume charge of the development of the independent companies in the state.

The managing committee of the reorganized Michigan Telephone company has completed its inspection of the state service, and the policy of the new management to extend and improve the service has already borne fruit. The Detroit residence and business service rates are to be reduced and also that of the long-distance and complete metallic circuits. In addition to the one-way service at \$12 per year, which furnishes an instrument upon which calls can be made and none received, recently introduced here, the company has also started a one-way service at \$18 per year, the subscriber being allowed one call of another subscriber per day, but as many calls for his telephone as others may wish to make. This service is especially designed to favor merchants and others having many incoming messages. It is also intended to make the rates for the state line service considerably lower than heretofore, and to base it upon the amount of time a line is in use.

Main exchange buildings, together with the new multiple switchboards of the relay system, will soon be erected in Battle Creek, Bay City, Lansing, Marquette, Port Huron and Kalamazoo by the Michigan Telephone company, which has also bought 1,000,000 pounds of copper, 100,000 feet of cable and 75,000 poles in Cleveland.

Troubles of a Telephone Promoter.

The *Evening Journal* of Jersey City has made a complete retraction of the charges printed a year ago against the Hudson Telephone company and George H. Atkinson, the moving spirit in that enterprise. Mr. Atkinson, accordingly, has discontinued the libel suit instituted by him against the newspaper. Concerning his plans, Mr. Atkinson made the following statement:

I planned to provide cheap telephone service to all the towns of New Jersey that desired it, so that my patrons would be united throughout the state and be benefited by their enterprise.

I started telephone exchanges in Newark, Trenton and Jersey City. The Newark exchange is doing a large business, and I connected all the exchanges with Jersey City, in which city the business is growing rapidly. I am connected with the Home Telephone company in Trenton, which is about twice as large as the Bell company's system in that city. I have started systems in Monmouth County and a large part of that county is being rapidly covered. I am treasurer of the State Telephone company, and am endeavoring, with that company, to connect all the companies, so that all the subscribers can reach each other. I am interested in a company that covers a large part of Somerset County, and have that system now connected with Newark and Jersey City, and am at work trying to connect the Monmouth and Somerset County systems with Trenton, and if I am successful there will be upward of 3,500 telephone subscribers in this state, talking together at rates which would never have been possible except for my work. In this same field, before I commenced my work, there were about 2,400 subscribers using Bell company's telephones.

Switchboard Company Dissolves.

The Fowler Switchboard and Telephone company of New York has applied for the voluntary dissolution of the corporation, and Justice Bookstaver has set down the order to show cause for May 2d. The directors are Samuel B. Fowler, John T. McRoy and L. Victor Fleckles. The company was incorporated on November 14th, with a capital stock of \$5,000, to manufacture and sell telephone switchboards. There are no creditors, and the company has property worth \$400, consisting of tools. In the capital-stock account there is a balance of \$500 on deposit in a Brooklyn bank and agreements of assignment of patents by S. B. Fowler, valued at \$2,000, and services rendered by L. V. Fleckles, valued at \$1,000.

MANUFACTURERS AND DEALERS.

The Eureka Electric company of Chicago is placing on the market a magnet bell for which many interesting claims are made. The contacts used throughout are platinum; the bell is full-nicked ringer coil of the Western Electric style, and the generator is highly finished. The new No. 44 transmitter is meeting with a ready sale and is giving general satisfaction. This transmitter is designed on scientific lines and is built for lasting qualities and good service.

"Everything used with telephones" is included in the stock handled by the Central Telephone and Electric company at 909 Market street, St. Louis, which recently moved into its new office, sample room and factory, the new quarters containing 8,500 feet of space entirely devoted to telephone goods. Everything, from telephones to fuse blocks, is carried in stock, and thus all orders can be promptly handled. The company's business is growing with the development of the independent field.

E. J. Noble of Chicago, manufacturer of woodwork for telephone and other electrical construction, has received several large orders of late from the Chicago Telephone company and the Central Union Telephone company. He has done business

with the Chicago Telephone company for over five years, and during that time has been called upon for woodwork of every variety. He has made many thousands of cable and terminal boxes for these companies, which have given especial satisfaction. Telephone companies in need of woodwork of this character will find it to their advantage to communicate with Mr. Noble when in the market.

The Western Electrical Supply company of St. Louis has recently made arrangements for the manufacture of a strictly high-grade bell of special design and construction, to be made exclusively for the telephone trade of this company, and in the future all its high-grade telephones will be mounted with these bells. The company is in a position to furnish this strictly high-grade bell, either bridging or series, separate from the instrument, when so desired. These bells are all made with a long hook, with excellent german-silver contacts and of the most modern design. Broad, noiseless gearing, automatic shunt and five magnets, all nickel-plated throughout, make it one of the most complete bells on the market.

Bert Hubbell, formerly of the Keystone Telephone company of Pittsburg and later with the American Electric Telephone company of Chicago, has recently associated himself with the Williams Electric company of Cleveland. Mr. Hubbell is one of the pioneer telephone men working in opposition to the Bell company, dating his experience from 1890, when he built an opposition telephone exchange. After that he organized the Keystone Telephone company and was largely instrumental in its rapid advancement. Since the consolidation of that company with the American Electric Telephone company Mr. Hubbell has had charge of its business at Chicago. The ability of the Williams Electric company to manufacture a superior grade of apparatus in the telephone line, coupled with Mr. Hubbell's knowledge of the telephone trade, insures a combination that should be eminently successful. This company has hitherto confined its product to magnetic bells and receivers, and its success in producing high-grade work of this nature has been so pronounced that it has recently gotten out a long-distance, solid-back transmitter that it claims possesses superior advantages, and is going to sell complete telephones and switchboards.

Telephone News from the Northwest.

[From the Minneapolis correspondent of the WESTERN ELECTRICIAN.]

M. C. Curfman of Moorhead, Minn., complains that the telephone company refuses to put in a telephone for him. The council ordered the company to put it in or show cause why it should not. The company claims that it would cost \$200 to make the connection, and there is no prospect of other patrons in that direction. Curfman may try to induce the council to declare the company's franchise forfeited.

The Northwestern Telephone Exchange company will extend its wires north from Winnipeg Junction, Minn., in the spring to Hitterdal and Ulen, Minn.

A meeting of the Chamber of Commerce in St. Paul was recently devoted to the matter of the telephone service and the long-distance company's reasons for refusing to come in under the offers made by the council. The manager of the Northwestern Telephone Exchange company asserted that there was nothing more than a traffic arrangement between his company and the American Telephone and Telegraph company, and that his company had no particular interest in the matter whether the long-distance company was admitted or not.

The mayor of Duluth thinks that a saving of \$175,000 would be effected by the citizens putting in a telephone exchange now, instead of waiting five years, as has been proposed. He estimates the cost of an exchange system with 1,000 connections and providing for subways in the business part of the city at \$125,000.

The Northwestern Telephone Exchange company has concluded not to build from Bathgate, N. D., to Pembina.

News comes from Detroit, Mich., of a scheme to unite all the lake ports by telephone. It would give connection from Quebec to Duluth and Superior, and would include the Soo, Marquette, Calumet and other towns in the upper Michigan peninsula.

C. F. Townsan is canvassing Belmont, Ia., for subscribers to a prospective telephone exchange. He is having good success.

The business men of Red Lake Falls, Minn., are considering a project to put in a local telephone exchange and also to secure telephone connection with Crookston.

The Hutchinson (Minn.) Telephone Exchange company has been granted a franchise and has begun installing an exchange.

The new telephone exchange at Bloomfield, Ia., is proving very popular and satisfactory.

The exchange at Stuart, Ia., is about completed. De Smet, S. D., now has connection with Sioux Falls, S. D.

The Standard Telephone company of Waukon, Ia., proposes to extend its toll lines to Dubuque, Iowa.

Bruening Brothers and others of Akeley, Ia., propose to form a stock company and establish a telephone exchange.

Representative Schurman has introduced a bill in the Minnesota Legislature providing for the plac-

ing of telephone and telegraph companies under the authority of the railroad and warehouse commissioners and making them common carriers.

The Standard Telephone company is canvassing Elkader, Ia., with a view to establishing an exchange there.

Telephone connection has been completed between Mount Etna and Bridgewater, Ia.

The Home Telephone company of Fort Dodge, Ia., will add another section to its switchboard, to accommodate 100 more instruments. The first board was provided for 300 drops, and was thought big enough to meet all immediate needs, but the exchange has proved so popular that the new section is needed.

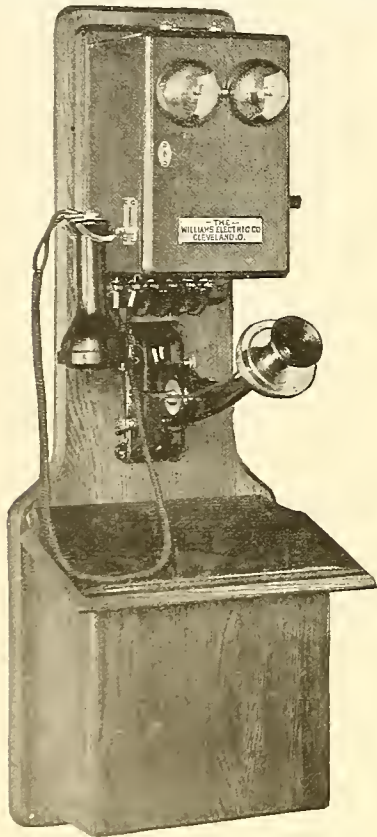
The Blue Earth Valley Telephone company has arranged to connect its toll lines with the new Citizens' Telephone company in Mankato, Minn.

A mutual telephone company has been organized at Marengo, Ia., to build a line from Ladora, Ia., to Genoa Bluffs and Marengo, with exchanges at the towns.

The Central Telephone company has bought the interests of J. W. Gregg and R. B. Dixon in the exchange at Rockwell City, Ia., and now has complete ownership.

Williams Long-distance Instrument.

The cut shows the new long-distance telephone which the Williams Electric company of Cleveland is just placing upon the market. This instrument



WILLIAMS LONG-DISTANCE INSTRUMENT.

embodies many new features which are interesting to telephone users in general and which add greatly to the efficiency of the telephone itself.

The magneto bells and receivers manufactured by this company have acquired such an enviable reputation for careful workmanship and general excellence that it is but natural to presume that in manufacturing a complete line of telephones the company will meet with the same success and maintain the same high standard.

Long Electric Railway.

The proposed electric line between Vincennes, Ind., and East St. Louis, crossing the state of Illinois, will be built by the Wabash and Mississippi Construction company, whose headquarters will be at Salem, Ill., about half-way between the termini of the road. This, it is said, will be the longest electric line in the world, and will be 160 miles long. It will follow the old stage road and will be almost parallel with the Baltimore and Ohio Southwestern road, passing through Olney, Clay City, Flora, Carlyle, Trenton and Lebanon. Over 100 miles of the right-of-way is now ready for the rail without grading. An officer of the company says that none of the stock is for sale, as all the money necessary for the completion of the road has been secured. The company, of course, will have to compete with the Baltimore and Ohio Southwestern. That road, he says, has had undputed possession of this fine territory since 1849. He thinks his company can cut rates in two and still make good profit. Work will be begun early in the spring, and it is expected to have the entire line ready for business by next fall.

New Photometer.

Illustrated herewith is a modification of the Queen standard photometer as made for the Fostoria Incandescent Lamp company. It was designed from suggestions of Mr. Hart of the Fostoria company.

The lamp manufacturer is often under contract whereby his lamps are sold at a rate depending upon the results of tests on a certain percentage delivered, and therefore he must be absolutely assured of their uniformity and correctness. But a small amount

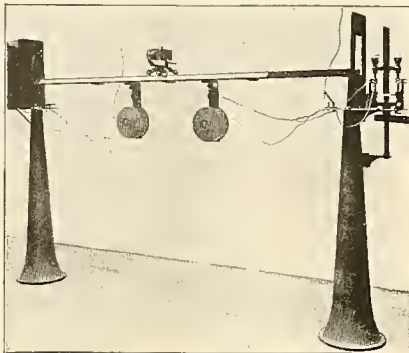


FIG. 1. NEW PHOTOMETER.

of time can be placed individually on the lamps in testing them, so the photometer must be possessed of the greatest accuracy and rapidity of measurement. The instrument described herewith is said to embody these characteristics in the highest degree.

Fig. 1 shows the complete instrument. At the left is a pedestal of iron carrying a stage, screen and curtain, and supporting one end of the photometer bar. An adjustable lamp support on the stage holds a secondary standard, a 16 candle power incandescent lamp. This is standardized by comparison with a pair of certified lamps furnished with the photometer.

The pedestal on the right supports the other end of the photometer bar and carries a screen and an automatic rotating socket.

The photometer bar carries a metal scale, graduated in inverse squares, and having the 16-point centrally located. By this arrangement the photometer reads directly in candles when using a 16 candle power standard. The scale is inclined from the vertical, so as to be illuminated by the test lamp and render the graduations legible.

The photometer carriage illustrated has a screen

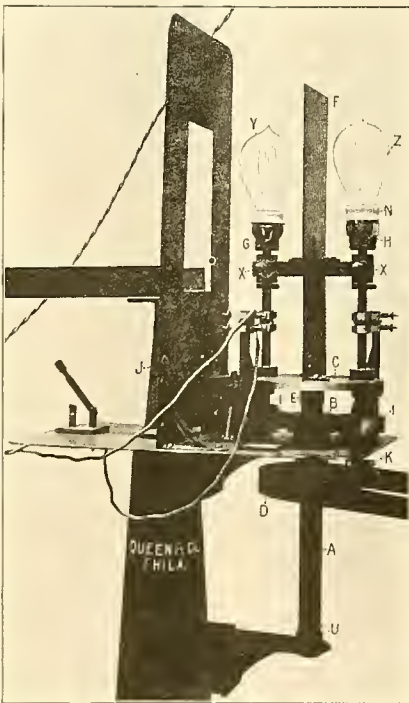


FIG. 2. NEW PHOTOMETER.

of the Lummer-Brodhuu type, an optical screen of great accuracy. When so desired, either a Bunsen or Leeson screen may be substituted.

The two rheostats below the photometer bar are for controlling the potential on the standard and test lamps respectively. They have each about 900 steps and permit of so small a variation of the candle power or potential as to be imperceptible on the most sensitive voltmeter.

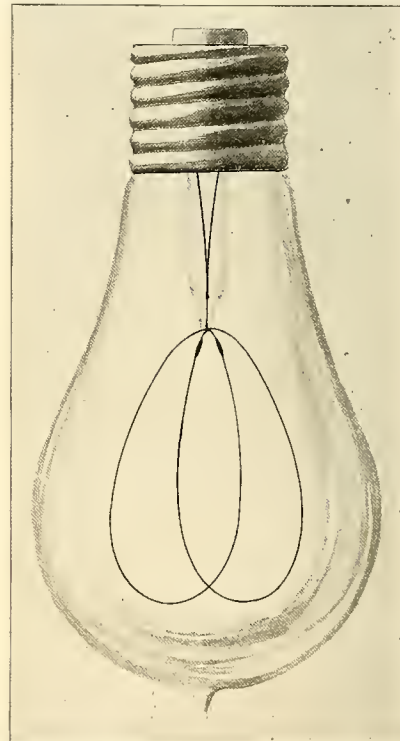
The rotating socket supported by the right pedestal is more clearly shown in Fig. 2. The main driving shaft A is hollow and journaled in a step U. It has attached to it a pulley D, driven from some power shaft, and a friction-driving pulley B. This shaft runs at 180 revolutions per minute. Within

this shaft is a central one E, carrying a plate C and the screen F. Upon the plate C are mounted two rotating sockets G and H. They have journals swung from centers at X and adjustable boxes at the bottom. Spring plugs keep a suitable pressure between the friction pulleys B, I and L. Collecting rings and brushes carry the current to the lamp.

At J is a lever which engages in the plate C, preventing it from moving. Under this condition the main shaft A, which is continuously rotating, will cause both lamps to revolve about their own axis at 180 revolutions per minute. If, however, the lever J is momentarily released, the lamps will revolve about the axis of the main shaft and one replace the other.

At K is a release, which attaches to a pedal below. Depressing this throws over the shaft of the rotating socket, which happens to be there, releasing the pulley I from the driving pulley and at the same time stopping the lamp.

The operation is as follows: When the operator at the photometer has tested the lamp Y the operator at the socket trips the lever J, and the lamps exchange places. In doing so they exchange brushes and therefore circuits. This construction is to permit of having lamp at Y on normal voltage and lamp at Z on low voltage. By this arrangement the operator in adjusting lamp at Z is not annoyed by a strong light. After exchanging the lamps the operator depresses pedal, and by means of the release K stops lamp Z. It is then removed and another substituted. Releasing the pedal starts the lamp rotating slowly or fast, as may be desired. If not running truly it may be pressed to one side, and it will stay where it is placed. This is accomplished



LYNN INCANDESCENT LAMP.

by using a special socket N, which is adapted to take lamps without base and has fluted contacts, to secure a proper adjustment of the lamp terminals. When the lamp runs truly, the lever J may be tripped, exchanging the positions of the two lamps as before.

The apparatus is manufactured by Queen & Co. of Philadelphia.

Lynn Incandescent Lamp.

The illustration shows the Lynn (Mass.) Incandescent Lamp company's "New Lynn" lamp, with oval anchored filament. The filament is anchored to the glass stem, and the company has a patent on its method of anchoring. The company claims to have "altogether the finest, most symmetrical and most pleasing lamp yet produced," "all that good workmanship and the best of materials can make it." It is said that each lamp is individually tested before it is permitted to leave the factory.

To Build Electric Boats.

The Electric Boat company, with authorized capital of \$10,000,000, was incorporated in New Jersey last week "to construct boats and other means of navigation and to operate steamship lines." The incorporators are Charles Blizard of the Electric Storage Battery company, William H. Palmer and Augustus Treadwell. Half of the stock is eight per cent. preferred and the rest common.

It is stated that the new company will devote special attention to submarine boats, and that it has undertaken immediately to resume the prosecution of the work on the Plunger, which has been suspended at the Columbian Iron Works for nearly a year, and also to put the submarine boat Holland into condi-

tion for service at once. Interested in the new company, it is said, are Clement A. Griscom, Moore & Schley, Perry Belmont, William McAdoo and others.

Latest Progress in the Application of Storage Batteries.

By JOSEPH APPLETON.

PART III.

The centralization of generating plants and their location in districts where the facilities for obtaining coal and water are good has developed. The system of high-tension, alternating transmission and the distribution of direct current through rotary converters seems to be the one which will be employed in most of the large engineering undertakings to be solved during the next few years. The advantages of direct current for distribution over the alternating are so marked that at least until further improvements are made in alternating-current distribution, the direct current will undoubtedly be the one most generally used. With this system of large central power houses and sub-stations for distribution through rotary converters, storage batteries are almost essential. They reduce the size of the generating plant in the first place, and also the size of the rotary converters, and enable them both to be operated with a much greater load factor than would be possible without.

The installation of the Hartford Electric Light company, with which you are probably familiar, was the first of this description in this country, and has proved the many advantages which were claimed for such a system.

An interesting application of this sort has recently been made on a small railroad plant in Montpelier, Vt. This plant was, I believe, the first railway plant in this country to be operated exclusively from rotary converters with a storage-battery auxiliary. The line operated is about nine miles long, and the sub-station is located about three miles from one end. The power is furnished from the Winooski River, the current being generated by three-phase alternators at 2,200 volts, and carried to step-down transformers, where it is raised to 6,300 volts. At this pressure it is carried to the sub-station, a distance of eight miles, where step-down transformers reduce it to 480 volts, at which pressure it is fed into the rotary converter. The capacity of this converter is 160 kilowatts, and it is especially wound for running directly in parallel with a storage battery. Its characteristic curve is similar to a shunt-wound generator; that is to say, as the load increases, its voltage would fall. By this means the battery will take care of all fluctuations, maintaining a fairly constant load on the rotary. The battery consists of 248 cells, each containing 11 plates 10 inches square. The one-hour rate of this battery is 200 amperes. With a maximum load of 300 amperes the rotary carries 125 and the battery 175. The greatest amount of variation of load on the rotary is 50 amperes, while the variation of load on the line is nearly 300 amperes. Such an installation shows clearly the advantages of battery regulation on a fluctuating load. The size of the rotary is reduced by practically one-half and the load on it is kept almost constant.

Most of the plants dealt with to-night have been those of a large size, supplying a large amount of energy. It must not be imagined that storage batteries are applicable only to these large stations. The results obtained are just as satisfactory in the case of smaller stations, but I have referred to the larger ones to-night as being of more interest. I will, however, give the results obtained in one of the smaller type.

The Claremont Electric Light company, at Claremont, N. H., operates a small plant by water and steam power, which consists of two Edison bipolar dynamos, running on the three-wire system, and an arc-light service supplied by a 50-light Thomson-Houston dynamo. In connection with the Edison dynamos, which are operating on the three-wire system, there is a battery plant of 134 cells; containing 11 plates in each cell 10 inches square. These batteries are operated directly in parallel with the Edison dynamos, and relieve them of a portion of the load during the time of heaviest demand. They also help out the steam plant, enabling the water power to be used to its fullest advantage. During the month of January, 1896, before the batteries were installed, it was found necessary to run an auxiliary engine 180 hours to supplement the water wheel, and in the same month in 1898, after the battery was installed, the same conditions of water power prevailing, the station load was 33 per cent. heavier, and it was only necessary to run the auxiliary steam engine 133 hours during the month.

In addition to this saving, the service given was far superior, owing to the steadier pressure which was maintained. The battery has also enabled the company to reduce its staff. The entire force employed in this plant now consists of a superintendent, a dynamo attendant and a lineman. The lineman also attends to the lamp trimming. Before the battery was installed there was, in addition, an engineer, while the average load was considerably less than at the present time.

There is one application of storage batteries in connection with central stations which I believe will

in time become very general, but which at the present time has only been tried in a few instances. It is the use of storage batteries in office buildings, stores, etc., instead of the usual isolated plant or direct supply from the central station. The method of operation is as follows:

During the few hours of maximum load at the central station the storage battery supplies the entire current for the building, it being disconnected from the street mains. During the hours of light load the building is connected with the street mains and the battery charged from them. By this means the central station can take as customers these buildings, and only have them on their system during the hours of light load. This is a class of customer which is not profitable for the central station, in the ordinary way, as they have a large number of lamps which are only used for a short period, and that at a time when the station has its maximum load. This means that they have to provide capacity for these lamps, and yet the plant is only needed for an hour or two each day. In one installation of this sort, the electric-light company says it can charge the battery at a time when it is glad to sell current for $\frac{1}{2}$ cents a kilowatt-hour, and it relieves the system at a time when current is worth 13 cents. This leaves a good margin for profit for both the user and the electric-light company. The cost of such a battery plant is less than the isolated plant would be for the same capacity and occupies very much less space, which, in some buildings, is an important matter. By this method the central station can also take customers having a fluctuating power load without feeling its disturbing effect on the system, the battery maintaining an even pressure at all times. This is particularly advantageous when the fluctuating load is some distance from the power house and the feeders are not large.

The use of storage batteries in connection with isolated plants for private houses is increasing very much. Such a generating plant without a battery requires a lot of attention, as the engine and the dynamo must, of course, be kept running all the time that current is required, and, moreover, it runs under a variable and uneconomical load. With a storage battery, however, current is available at any time, and the generating plant need only be run to charge the battery or when an unusually large amount of current is required for special occasions. This class of work is very light on the storage battery, as usually it is only charged two or three times a week, and is only discharged for a short time every day.

The power house of a plant of this kind, which I have in mind, is situated about 100 yards from the residence, and is 21 feet long by 16 feet wide, divided into two rooms, one for the engine, dynamo and switchboard, the other for the storage battery. The residence is wired for 300 16 candle power lamps, and the plant consists of a 19½ horse power Otto gas engine, belted to a shunt-wound dynamo of 12½ kilowatts capacity, wound for a range of voltage 110 to 150. The storage battery consists of 60 cells, each containing 13 plates 10½ inches square. These elements are mounted in glass jars, placed in sand trays. Plates hang on the sides of the jars, small lugs being cast on them for this purpose. The capacity of the battery is 60 amperes for eight hours, 81 amperes for five hours, 120 amperes for three hours. The switchboard is built in the partition between the battery and engine room, so as to save space and to allow a free access to the back of the board.

Circuits are arranged so that any combination can be effected, viz., to supply lamps while charging the battery, or to charge the battery alone; to supply the lamps from either battery or dynamo direct, or with the two running in parallel.

The storage battery of to-day is a practical piece of apparatus; the days when it was considered an experiment have passed. Large sums of money are being expended in experiments to reduce the cost of manufacture and lighten the weight, and it is in these directions that the greatest future improvements may be looked for.

Electrically Driven Printing-presses in Kansas City.

Two installations of electric motors to operate printing-presses have been recently made in Kansas City—one in the *Star* newspaper establishment and the other for the Union Bank Note company.

In the *Star* plant each of five large double perfecting presses, having a combined capacity of 120,000 papers an hour, has been connected with a 35 horse power, slow-speed, multipolar motor. The motors are direct-current and are operated on 220-volt circuits from two 75-kilowatt dynamos which are driven by a Corliss engine. In connection with each motor a 20 horse power Cutler-Hammer speed-regulating rheostat is used. These rheostats are provided with a sensitive overload and a releasing automatic. The rheostats stand on the top of the presses, and from each a circuit in which a number of switches have been placed extends to all parts of the press. By opening any one of these switches the automatic is thrown and the press is brought to an instant stop. By means of these rheostats the press can be started at the lowest possible speeds and operated at all intermediate speeds to the maximum. This not only facilitates the changing of plates and rollers, but

makes a great saving in paper wasted in breaking where other power is employed.

The Union Bank Note company has a complete plant, consisting of an Ideal engine and direct-connected Lundell generator, with motors ranging from one-quarter to three horse power, all direct-connected to various presses on different floors. Upon the extended driving shaft of each press a separate motor is mounted, the armature of the motor being placed directly on the press shaft. Controllers and rheostats give all desired variation of speed from 75 to 1,800 revolutions per minute on the different presses.

These installations are believed to be the only ones of the kind between Chicago and San Francisco. The work of installing them was done by Hodge, Walsh & Loring of Kansas City.

CORRESPONDENCE.

New York Notes.

NEW YORK, February 13.—The daily papers have told the readers of the *WESTERN ELECTRICIAN* all about the great storm and its interference with all street traffic, so I will not reiterate a tale that has been told. But I may note that the underground-conduct roads held their own very well when compared with the other surface lines.

There have been no important developments in the Manhattan situation. President Gould favors electrical equipment, but as for old Russell Sage—well, he has his doubts. However, Mr. Gould is the larger stockholder and has the principal following in the board of directors. It is said that for a long time Mr. Gould refrained from pressing his views and deferred to Mr. Sage's wishes. This deference was sentimental rather than wise, Mr. Gould has not cared to oppose the old gentleman because Jay Gould had always borne the closest business relations with the venerable financier. It is Mr. Gould's policy to retain the friendship and the collaboration of his father's associates. But in this instance George Gould has been compelled to institute an exception. It is believed that no opposition to the proposal to issue \$18,000,000 additional stock for the purpose of effecting the projected improvements will develop at the special meeting of stockholders of the road to be held on February 28th for the purpose of authorizing the issue. George Westinghouse was in town last week, and it was asserted—and denied also—that he was on the lookout for the Manhattan contract. There is another rumor connecting the Electric Storage Battery company with the contract, but it seems unlikely that the Philadelphia company would make any attempt to get any more than the share of the business coming within its line.

The special meeting of the stockholders of the Brooklyn Rapid Transit company, called to consider the proposed increase of the capital stock of that company from \$20,000,000 to \$45,000,000, was held at the office of the company on Saturday morning. All the stock was represented and the vote was unanimous in favor of the increase. In addition, the holders of 149,386 Central Trust company's certificates of beneficial interest gave their consent to the proposed increase. No further business was transacted at the meeting. It is believed that the increase was for the purpose of enabling the Transit company to take up the Nassau holdings of the Johnsons, Mr. Wilson and others, who together held 60 per cent of the shares, and also to place at the disposal of the Transit people \$15,000,000 of stock for the acquisition of the two elevated lines when the elevated people are ready to sell out reasonably.

The Brooklyn Union Elevated Railroad company, a reorganization of the Brooklyn Elevated Railroad company, has been incorporated, with a capital stock of \$18,000,000. The officers of the new company are: President, Frederick Uhlmann; vice-president, William Halls, Jr.; treasurer, General George W. Wingate; secretary, Elmer E. Whittaker. Arrangements were made for the dissolution of the receivership, and it is expected that within 10 days the new company will be in complete control of the road. The next step will probably be the renewal of the negotiations looking to the absorption of the road by the Brooklyn Rapid Transit company. M. S.

New England News.

Boston, February 13.—Contracts were awarded last week by the Boston elevated railway officials for the building of the new elevated structure of the company on Washington street in the section through the Roxbury district, and on Main street in the Brinker Hill district. The Pencoed Iron Works will furnish the material and put up the structure, and the cost will amount to nearly \$500,000. Upward of 8,300 tons of metal will be used in carrying out the contracts. This does not include tracks and stations. Other sections of the road are in the plan stage, and bids will soon be called for.

The subway idea is popular in the metropolis of New England. Mayor Quincy has just petitioned the Legislature for permission to build a few more subways, and the new project contemplates the construction of underground ways from the south end of the city proper to Causeway street and to Scollay square, connecting at certain points with the existing subways and passing near the Northern and Southern Union stations.

The declaration of a further distribution of

\$19.05 2-3 on General Electric preferred stock by the directors last week closes up the gap and settles the outstanding account of \$59.89 a share which was left over from the old regime when the capital stock was reduced. This puts the common stock on a prospective dividend-paying level and has created a bullish feeling in that property.

The Boston Transit company has been organized in this city and incorporated under Massachusetts laws, with an authorized capital of \$100,000, to act as a common carrier, using vehicles propelled by gasoline, electricity, compressed air or other means of locomotion. B. D. Hyde, H. N. Rice, A. A. Pope, C. N. Cole, G. H. Whitcomb and W. H. Coolidge are the incorporators.

John Lundie, widely known as an expert in railroad engineering, has been secured as consulting engineer by the Boston Elevated Railway company in connection with the construction of the new overhead lines for this city.

The Massachusetts Construction company of Boston has been organized, with a capitalization of \$150,000, to handle electrical supplies. Charles G. Kidd is president and Wallace D. Lovell, treasurer.

At Whitinsville, Mass., a street-railway company has been formed to operate an electric line between that place and Whitin Station, with a capital of \$12,000.

The Woodbury and Southbury Electric company has been organized at Woodbury, Conn., with a stock of \$50,000, to operate a road through Waterbury, Woodbury and Southbury. The officials are: President, James Huntington; secretary and treasurer, E. S. Boyd.

Bids for the construction of the big drydock for the Boston navy yard, which were opened in Washington recently, took a wide range on the electrical machinery to be used in connection with the dock. The lowest bidder was the Thresher Electric company of Dayton, O., which named \$149,892 as its price.

The Boston Elevated Railway company has placed an order for 80 open cars, deliveries to begin May 1st, with the American Car company of St. Louis. Fifty of the cars will have single trucks and 30 double trucks.

The students and faculty of Tufts College have formed the Tufts College Engineering society. Undergraduates in the engineering courses are eligible for active membership, and alumni of the department are eligible for associate membership. Eugene E. Gibson of the class of 1899 is president and the charter membership is 52.

From the 34th annual catalogue of the Massachusetts Institute of Technology it is learned that there are 104 students in electrical engineering, 140 in civil engineering, 162 in mechanical engineering, 66 in mining engineering, 43 in chemical engineering and seven in sanitary engineering.

In the Maine Legislature a bill has been introduced abolishing the \$10,000,000 limit on the capitalization of corporations. It is a bid for the business that now goes to New Jersey in the formation of large corporations, and it is expected that the state will receive a large revenue from the increased number of companies formed there in case the bill becomes a law.

A corporation with authorized capital of \$5,000,000 is projected in Boston, to be known as the International Construction and Power company. The principal promoters are E. P. Shaw, who is treasurer of the commonwealth, his two sons, N. Sumner Mirick, P. W. Sprague, J. A. Brackett and George A. Butman. These gentlemen are all well known in connection with railway ventures, and the corporation will succeed the firm of J. F. Shaw & Co., of which the elder Shaw and his sons are the principal members. They have asked for a very broad charter, which gave rise to all sorts of surmises regarding the scope of their operations. Mr. Shaw states, however, that in asking for power to construct in the United States and territories or colonies they had nothing more definite in mind than the possibilities that may arise in the development of this country's new possessions. He expressly denied any intention of absorbing a large number of Massachusetts roads—a possibility which had been suggested in connection with the matter of incorporation by interested observers.

A Boston syndicate has secured control of the stock of the electric-light corporation of Lowell, Mass., paying the par value of \$100 per share for about 1,800 shares of the stock. There had been dissatisfaction with the previous management, and control was secured in order to bring about a change in the directorate. The annual meeting was held in Lowell February 1st, and the following-named directors were chosen: F. R. Hart and W. C. Forbes, Milton; E. S. Webster and C. A. Stone, Newton; L. J. Webster, E. Wadsworth and G. W. Lee, Boston. W. H. Bent of Lowell was re-elected clerk and treasurer.

In the Massachusetts Legislature a bill has been submitted, providing for the appointment of a commissioner of railway-telegraph service by the governor. The measure provides for an examination before the commissioner of every telegraph operator employed in the state by any railway company, and certificate of competency will be given, in the case of engineers, pilots and others, upon whose skill depends the safety of the traveling public. No railway shall employ other than certified operators in case the bill becomes a law. B.

Western New York.

NIAGARA FALLS, N. Y., February 11.—Tonawanda is having a great deal of trouble in regard to the rate of speed at which the cars of the Buffalo and Niagara Falls electric road and the Buffalo and Lockport road are run through the streets of that village, and of late the village officials have been engaged in enforcing the ordinance, which says the speed of the cars shall not be over eight miles an hour. A policeman was ordered to watch the cars, and he boarded several in citizen's clothes. One day he took the conductor of one of the cars to the police station with him, where the police justice fined the conductor \$5. The rate of speed at which the cars passed between certain points was secured, it is alleged, and then the village officials started out to serve papers on the company. It was over three weeks before any of them were found in the village, and when the cases were to be heard an adjournment of a week was taken. Finally the cases were called. No one appeared to represent the railway company. In all there were nine cases, seven against the Buffalo and Niagara Falls road and two against the Buffalo and Lockport road. Eight of the cases were in regard to the speed of the cars, and the other alleged that a car had been run through the village without having the life-guard attached. Judgments were entered against the railway companies in all the cases, the penalty of \$100 for each violation making, with costs, a judgment of \$927. The superintendent has notified motormen and conductors to observe the legal rate of speed. It is said that the reason the railway companies were not represented at the hearing was because President Ely had an understanding with a village official for another adjournment, which the justice would not grant. No doubt there will be more to the cases, for President Ely is a lawyer of prominence and a fighter from the shoulder. It is understood the ordinance will be changed to at least 12 miles an hour, as Tonawandas themselves object to the slow speed of eight miles an hour.

It is expected that by October 1st next the Niagara Falls Power company will have 10 generators in operation in its station, the contracts for two additional turbines and generators having just been awarded. The I. P. Morris company of Philadelphia will make the turbines, and the Westinghouse Electric and Manufacturing company will make the generators. This will make the total capacity of the station 50,000 horse power, which is believed to be the total capacity intended for it. As the tunnel has a capacity of 100,000 horse power, the announcement that the Niagara Falls Power company will soon break ground for a new station would not be surprising.

Recent high, easterly winds resulted in low water at Niagara, and some little difficulty was experienced by the mills on the hydraulic canal and in the power house of the Niagara Falls Park and River railway on the Canadian side. The low water allowed the ice to settle on the reefs and bottom in front of the entrance to the canal, diverting the water, and the same results were experienced on the Canadian side, where trouble from ice is expected at this time every year. For three days the electric current of the Niagara Falls Park and River railway was shut off and the cars idle, all the water that came to the power house being employed in operating the wheel connected to the generators of the Canadian Niagara Power company, so that patrons of that company might have current. The low water interfered with the water supply of Niagara Falls, Ont., for fire and household purposes, and Mayor Slater asked Mayor Hastings of Niagara Falls, N. Y., to furnish a supply through a line of hose laid across the lower steel-arch bridge. The municipal water plant of Niagara Falls, N. Y., is on the hydraulic canal, and although the supply of water there was none too plentiful international courtesy demanded that the request be granted, and so Mayor Hastings had a line of fire hose stretched across the arch from a hydrant at the New York end. In this way a water famine was averted. O. E. D.

Northwestern Notations.

MINNEAPOLIS, February 11.—It is understood that George C. Edwards of Bridgeport, Conn., is investigating the prospects for a successful electric line from Albert Lea, Minn., to Clark's Grove and Geneva.

M. E. Helmer of Fond du Lac, Wis., has been East to secure estimates of cost for an electric power plant, and will probably put one in soon.

Morse & Zimmerman have been granted a franchise for electric lighting at Lone Tree, Ia., and will proceed to install a plant at once.

The Minneapolis Board of Trade recommends the construction of a third interurban electric line to St. Paul by connecting the Minnehaha line in Minneapolis with the Snelling avenue line in St. Paul. There is only about a mile of track to be laid to connect the two lines.

The water-works committee of the Minneapolis Council is considering putting in two new pumps of the "Jumbo" pattern, and operating them by electricity, at the North Side pumping station.

A consolidation of the five different electric transmission lines in Sioux City, Ia., will be effected in 60 days. It will greatly reduce the cost of urban transportation and will also enable the lines to be operated more cheaply. The companies affected are the

Sioux City Traction company, with 30 miles of track; the Central Traction company, with 10 miles of track; the Riverside Electric company, with five miles of track; the Leeds Electric Railway company, with four miles of track, and the Morningside Elevated Railway company, with four miles of track. They all use electricity for motive power.

The Street Railway and Power company of Menominee, Mich., has let the contract to the Filer & Stowell company of Milwaukee to furnish a new Corliss engine of 518 horse power for the remodeled power station.

The Supreme Court of Minnesota holds that the contract of the city of Little Falls, Minn., with the Little Falls Electric and Water company, running 34 years, is unreasonable, owing to the length of time, and therefore void.

The syndicate controlling the street-car lines of Davenport, Rock Island and Moline has bought the Moline Central line.

The electric-light station at Iowa City, Ia., was burned, with a loss of \$20,000; the insurance is \$13,000. The company will rebuild at once.

The Chicago, Harvard and Geneva Lake Railroad company has filed articles of incorporation in Wisconsin to build from Harvard to Geneva Lake. C. T. Bundy and L. C. Church of Eau Claire, Wis., are incorporators.

Milton, Ia., is considering the electric-light question.

Electric lights are projected at Pulaski, Ia. The Citizens' Traction company of Oshkosh, Wis., has won its case and the right to cross the tracks of the Chicago and Northwestern Railroad company in Oshkosh before the appraisal committee.

The electric machinery for the new electric-light plant to be installed at Lewistown, Mont., has been received at the shipping point, and will be hauled overland as rapidly as possible. It is expected to have the system in operation by April 1st.

B. F. Ramsdell has been promoted from manager of the Postal Telegraph company's office in Anacosta, Mont., to manager of the office at Helena, Mont.

An ordinance requiring fenders on the street cars has been introduced in the council of Des Moines, Iowa.

Fonda, Ia., has voted to establish an electric-light plant.

The Mount Vernon Electric Light company of Mount Vernon, Wash., offers to remove its plant to Sedro-Woolley if given a franchise and exempted from taxes for a number of years.

The Fox River Valley Electric Railway company announces that it will build the interurban electric line between Neenah, Wis., and Oshkosh whenever the cities of Neenah and Kankana evince any desire for it.

The Fort Wayne Electric corporation will submit a proposition to the city of Elroy, Wis., for the establishment of an electric-light plant which the city can buy at any time at cost.

Capitalists of Cleveland, O., are after a franchise for an interurban electric line from Stillwater, Minn., to St. Paul. The Twin City Rapid Transit company is also after the franchise, and offers to have the road in operation by July 1st, if given the franchise.

It is reported that the Chippewa Valley Electric Railway company will extend its interurban line between Eau Claire and Chippewa Falls, Wis., to Bloomer.

The Perry Electric Light company of Perry, Ia., has sold its plant to John R. Swearingen and Frank Dobson of that city for \$20,000. M. S. P.

PERSONAL.

Henry B. Cutter, president and general manager of the Cutter Electrical and Manufacturing company of Philadelphia, was a welcome visitor to Chicago last week.

Dr. Louis Duncan and M. K. Eyre have formed a partnership as consulting engineers, under the firm name of Duncan & Eyre, with offices in the Empire building, New York.

Mr. H. P. Broughton has closed his electrical business in St. Louis and has taken a position with the western sales department of the Abendroth & Root Manufacturing company at Chicago.

Herbert Lloyd, general manager of the Electric Storage Battery company of Philadelphia, was in Chicago for a few days last week. Joseph Appleton, chief engineer of the same company, is now in town.

ELECTRIC LIGHTING.

H. V. Gates of Hillsboro, Ore., will put in an electric-light plant in the spring.

The authorities of Tepic, Mexico, are trying to arrange for an electric-lighting system for the city.

The city of Chicago has begun a prosecution in Justice Gibbons' court against the Jefferson Electric Light and Power company, charged with stringing wires without a permit under sidewalks at 246, 245 and 254 State street.

The Auburn (Cal.) Electric Light and Power company intends to put in a plant of 300 horse power capacity of the latest style machinery. The current will be alternating and multiphase, suitable for both lights and power. The works will be

located at the North Fork dam, about two miles from the town.

The Massena Electric Light and Power company (capital, \$10,000) has been incorporated. The directors are Thomas H. Gillespie, R. A. Johnson, E. M. Stathers of New York, Henry W. Merwin of Brooklyn and Robert Swan of Massena.

The Black Oak Mine company is making arrangements to supply electric lights to Soulsbyville, Cal. A larger dynamo is to take the place of the smaller one that furnishes light for the mine alone. The undertaking is to be pushed to completion as rapidly as possible.

The Consolidated Canal company has been granted right-of-way in Tempe, Ariz., for constructing a line for electric-light and power purposes. Bowen & Ferry of Detroit are the principal owners of the company. Mesa has been lighted by the company, and the plans include an extension of the system to Phoenix, 16 miles distant.

ELECTRIC RAILWAYS.

An ordinance has been introduced authorizing the San Diego, Pacific Beach and La Jolla Railroad company to electrically equip its road. The road has recently been purchased by Spreckels Bros.

An investigating committee in St. Louis has discovered that, owing to the carelessness or corruption of city officials, the city has been deprived of annual revenue from street-car licenses estimated at between \$7,500 and \$15,000.

At the annual meeting of the stockholders of the New Orleans, La., Traction company, the following-named directors were elected: R. M. Walmsley, J. C. Denis, A. Baldwin, C. H. Hyams, Frank T. Howard, C. D. Wyman and John C. Russell.

James H. Boyd, leader in the movement looking toward the building of an electric road in San Bernardino, Cal., and continuing to Highland and Redlands, asks the people of the first-named city to contribute \$15,000, which amount Mr. Boyd considers necessary to insure the success of the enterprise.

The *Los Angeles Herald* of recent date asserts that the Southern Pacific Railroad company has decided to electrically equip 220 miles of road, branch spurs, etc., including lines to San Pedro, Santa Monica, Santa Ana and Tustin, Sangus and Chatsworth Park, Riverside and San Bernardino, Duarte and other points.

A bill has been introduced in the New York Legislature providing that all street-railway companies in cities of the first class shall issue coupon tickets for a round trip. These tickets are to be furnished by the roads to school principals and head teachers, who will sell them to the pupils. They will be good from 8 to 9 a. m., 12 m. to 1 p. m., and from 3 to 4 p. m.

The Massena Electric Street Railway company of Massena, St. Lawrence County, New York, has been incorporated. The capital is \$100,000 and the directors are Thomas H. Gillespie, H. A. Johnson, E. M. Stathers, Howard Hasbrouck, Edward M. Nolan, Thomas D. Harris, Willard A. Esselstyne and James R. Jones of New York and Robert Swan of Massena.

The Georgetown, Rowley and Ipswich (Mass.) Street Railway company is in process of organization. It is capitalized at \$150,000 and will build an extension of the Haverhill, Georgetown and Danvers road by way of Georgetown, Byfield, Rowley and Ipswich. The directors are Charles E. Barnes of Plymouth, Arthur Bishop of Rowley, W. B. Ferguson of Malden, Lewis R. Hovey of Ipswich, Benjamin Parsons, Jr., of Georgetown, George A. Butman (treasurer) of Malden and E. B. Fuller (clerk) of Haverhill.

Employees of the Union Railway company of New York worked all night recently laying an electric railroad track nearly a mile long in Fourth street, North Pelham, with which to connect the belt line around the cities of Mount Vernon and New Rochelle. The haste of the company was due to a decision given in the Supreme Court that both the Union and the New York, Westchester and Connecticut Traction company had legal franchises on the street. The judge is said to have expressed the opinion that the first company to begin work would have the right to use the middle of the street. As soon as the Union company heard the decision it fitted out an expedition of two cars, and, loading them with ties and rails and 100 men, hurried them to North Pelham. The next morning when the residents awoke they were dumfounded to find a trolley road running down the middle of the principal street.

A test case of a very important question to all street railways has just been decided in Rochester. It was an action brought by Charles Summers against the Rochester Railway company to recover detectors' fees and other expenses in caring for the injuries to his six-year-old boy, who was run over

in front of the Frank street school by a trolley. The question at issue was whether a street-railway corporation is guilty of negligence in not running its cars slowly by a schoolhouse, around which young children are in the habit of congregating. Judge Sutherland made a ruling in the affirmative. He held that the contention as to the speed of the car in the case on trial was a question of fact for the jury. After a few minutes' deliberation the jury returned a verdict in favor of the plaintiff, fixing the damage at \$400. A suit for \$20,000 damages, brought by the injured lad, through a guardian, is now pending in the courts.

POWER TRANSMISSION.

An ordinance has been passed granting the Southern California Power company permission to construct and operate a pole line through South Pasadena for transmitting electricity from Shorb Station to Pasadena.

PUBLICATIONS.

The Royal Electric company of Peoria issues a bulletin of alternating-current generators. It claims to have been the first to introduce in the United States the inductor type of alternators, and the circular is devoted to description and illustration of this type. The simplicity and reliability of the machine are emphasized. The manufacturing company presents it to the trade as the highest embodiment of the art.

TELEGRAPH.

The president of Venezuela has directed the laying of a submarine cable to connect Margarita with other parts of the republic. It is also announced that the secretary of the Postal and Telegraph Department of Venezuela has ordered new postal and telegraph maps to be made, as those now in existence do not show sufficient details.

The Western Union Telegraph company has announced that on and after February 15th the rate from all its offices in the United States east of the Mississippi River, including St. Louis and Galveston, to Havana, Cuba, would be 25 cents a word instead of 40 cents, as formerly. From offices west of the Mississippi River the rate to Havana, Cuba, will be 35 cents a word instead of 50 cents, as formerly, and from British Columbia and Northwest Territories to Havana, 45 cents a word instead of 60 cents. The rate beyond Havana to Cienfuegos, Casilda and Tunas, Cuba, will be 20 cents a word, and to Jucaro, Santa Cruz, Manzanillo and Santiago, Cuba, 25 cents a word. From the same date the rate from all offices east of the Mississippi River, including St. Louis and Galveston, to Porto Rico, will be 75 cents a word instead of \$1.17, and from all offices west of the Mississippi River in the United States, excepting St. Louis and Galveston, and from British Columbia, to Porto Rico, will be 85 cents a word instead of \$1.27.

INDUSTRIAL COMBINATIONS.

Arrangements have been completed for the consolidation of illuminating and natural-gas and electric properties, plants and franchises in central and southern Indiana and Ohio. E. C. Benedict, who has large investments in gas property throughout Indiana, is the principal factor in the combination. Associated with him are Anthony N. Brady, Frederick P. Olcott, Samuel Thomas, Charles F. Dietrich, John Sloan and Samuel Thorne.

Articles of incorporation of the Wahmita Copper Mining company were filed at Trenton on February 11th by James B. Dill of New York. The company's principal office is to be in Jersey City, and its capital is stated to be \$1,000,000, with the right to increase. The company is a Boston concern. The incorporators are all of that city. They are Frederick H. Clark, James H. Fuller and Henry F. Whitney. The incorporation of the company is said to be another step in the fulfillment of the plan for combining all the copper interests of this country and other countries in one large company.

The *New York Tribune* asserts that negotiations are going on for a combination of all the large steam-engine building companies of the United States into a new corporation, to be capitalized at \$20,000,000 or \$25,000,000. The Corliss Steam Engine company's plant at Providence, one of the largest engine works in the world, has already been secured, it is said, in the interest of the syndicate. Joseph H. Hoadley of New York, president of the New York Auto-truck company, is interested in the engine-building consolidation project, and is quoted as saying in reference to it: "It is the intention to take in all the large steam-engine building plants in America. The organization is composed of the Cramps of Philadelphia, Lewis Nixon of Elizabeth and this city, and bankers in New York, Philadelphia, Providence and Boston. The company that has been taken in in Providence and which starts

the combination is the original Corliss company which has been in existence and famous for many years. We paid \$3,000,000 for it. This company will be followed in a few days by the Providence Steam Engine company and the American Wheelock Engine company of Worcester. When the deal has been closed for these, several large western concerns will be absorbed. The arrangements for acquiring them will be completed at a meeting to be held in this city within a week. The president of the new company is Colonel D. M. Thompson of Providence, and the directors will include Edwin S. Cramp, Lewis Nixon, W. H. Knight and Charles A. Lieb. Our principal object in gaining control of these companies is to supersede the power of steam with that of compressed air. I think that ultimately compressed air will be the power popularly used, and that at some future time it will be on an equal footing with electricity."

The stock of the Citizens' Street Railroad company and the franchise of the City company, both of Indianapolis, have been purchased by capitalists of that city, New York and Philadelphia, and the stockholders will reincorporate soon under a new name, and the plant will be placed under an entirely new management. The negotiations have been conducted by Hugh McGowan of Kansas City, who organized the purchasing syndicate, and the price paid was about \$3,000,000. Mr. McGowan states that when he came to look over the field he was convinced that the conditions were such that the people would never be in hearty accord with the Philadelphia owners of the Citizens' plant, and he candidly informed them of the fact and suggested that the best way out of the trouble was to sell the property. "When the Supreme Court granted a hearing in the litigation between the companies and the city," said he, "it was clear that the case would be reversed, and that the City company would be deprived of its charter by that court, which would uphold the law of 1897, declaring all charters void after 1901. The City company was ready to sell, and it was purchased by the syndicate."

TRADE NEWS.

The Sommer Electrical company, doing a general electrical contracting business, announces that it has opened at 785 Broad street, Newark, N. J., a thoroughly up-to-date establishment for electrical work.

The Kester Electric Manufacturing company of Buffalo has leased the building at 241 South Jefferson street, Chicago, and will remove its manufacturing plant to this city about March 1st. The company was recently incorporated in Illinois. J. F. Kester, who designed the apparatus manufactured by the company, is the president.

The Utica (N. Y.) Gas Engine Works, of which H. R. Illingworth and J. J. Lanz are the proprietors, is steadily at work turning out its product. The engine is of the four-cycle type, self-lubricating, with poppet valves. It has a simple regulator, said to be very efficient. It runs steadily on gas or gasoline and is adapted for driving small dynamos. Illingworth & Lanz are also agents in Utica for the Lundell dynamos and motors.

Mr. E. G. Acheson has organized a company, under the laws of New Jersey, with a capital stock of \$1,000,000, to manufacture graphite and pure carbon at Niagara Falls. The company is called the Acheson Graphite company, and its plant will be located on the lands of the Niagara Falls Power company. The process will consist of the conversion of the amorphous form of graphite, as found in coke, to the graphitized form, and it is expected that the company will be able to put its manufactured product on the market much cheaper than any of the establishments now doing business. If the Graphite company can prevail upon established concerns to use its manufactured article, it will not go into the details of the business and manufacture all the articles in which graphite and carbon are used. If it is necessary, however, it will make all articles in order to get its product on the market. At first the company will start with about 500 electrical horse power, which will be increased as the growth of the business demands. Charles R. Huntley of Buffalo is vice-president and treasurer of the company.

BUSINESS.

Laird & Lee, the Chicago publishers, call attention to their stock of practical books of all kinds.

A 125-kilowatt light and power plant has been installed in the National Bank of Commerce, Kansas City, by W. T. Osborn & Co. There are two dynamos and engines, supplying about 1,000 lamps and an elevator motor. The electrical contractors are congratulated on the character of their work.

The Electric Appliance company desires to call the attention of everyone in the electrical industry to the map of Chicago's business district. From a good

map of the downtown part of the city one may get an idea of the accessibility of the new location of the company at 92 and 94 West Van Buren street. Everybody is urged to look it up and see for himself.

The Central Electric company, Chicago, is calling the attention of users of copper wire to the attractive prices which it is enabled to make on weatherproof, magnet, office and annunciator wire. As is well known, the price of copper wire has increased, and is still going higher, but nevertheless the Central Electric company, by commendable foresight, is enabled to make attractive prices. Buyers will find it to their advantage, it is said, to find out what the Central Electric company has to offer before placing their orders.

The principal claim of merit made for the primary-battery cell made by Harrison Bros. & Co. of Philadelphia is the high electromotive force of 2.45 volts. The cell is especially adapted to open-circuit and what may be termed semi-open-circuit work. The high voltage is obtained by the use of zinc as the positive element and peroxide of lead as the negative. Peroxide of lead is the active material of the storage battery. By placing it in juxtaposition to zinc, the high voltage of nearly 2.45 volts per cell is obtained, the electrolyte being a dilute sulphuric acid. In this cell, which is the result of several years' experiments, one ounce of zinc will, it is said, give 20 ampere-hours at an average of 2.2 volts. Theoretically, there is enough lead peroxide in each cell to depolarize three ounces of zinc. This would give a capacity of 60 ampere-hours. In actual practice, with a slow rate of discharge on open-circuit work, about two-thirds of the theoretical is possible, or 40 ampere-hours. One charge of acid will dissolve

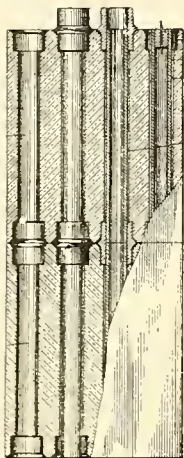
one ounce of zinc without undue increase of internal resistance. Local action does not occur, even when the zinc gets rough, as the zinc is self-amalgamating to the last. Eight ounces of the peroxide of lead is used in the manufacture of one stick of negative element. It is estimated that the cost of the electrical energy obtained from this cell is a little over one cent per watt-hour. In a test of these cells made recently by Mr. Milford Lewis, it was shown that after nearly four months' working the electromotive force, originally 2.49 volts, had decreased to only 2.4 volts. Besides its special adaptation to open-circuit work, such as electric bells, burglar alarms, telephone transmitters, etc., the cell is adapted for the operation of physicians and dentists' miniature lamps, two cells six inches high by four inches square being sufficient to light up such lamps to full brilliancy. The Thermo-electric company, Times building, New York, is the sole agent for the sales of this cell.

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued February 7, 1899.

618,837. Conduit for Wires or Cables. Edward H. Callaway, New York, N. Y. Application filed December 24, 1897.

Perforated sections of suitable non-conducting material have a countersunk recess around the end of each perforation, a connecting sleeve made of insulating material adapted to fit into the countersunk recesses of two adjacent sections and to thereby unite the sections so that the ends of the sections will come into contact with each other, and removable inner sections of tubes made of insulating material and of such diameter as to project into the connecting sleeve and of such length as to meet at their ends.



NO. 618,837.

618,848. Electric Arc Lamp. Walter E. Dennis, New York, N. Y. Application filed January 22, 1898.

In a mechanism for operating the electrodes of an electrical arc lamp the continuous rack bar is secured to the armature or movable core, and arranged to move with the same, and to clutch the carrier and to release it by the movement of the armature or core, controlled by the electric current in its passage from one electrode to the other.

618,853. Brush Holder for Dynamo-electric Machines. Gano S. Dunn, East Orange, N. J. Application filed April 30, 1898.

The brush-holder rigging is centered upon the axis of the commutator and is revolved in the center thereof, and brush-holder supports are mounted upon the rigging and independently adjustable thereon circumferentially around the commutator, and adjustable together around the commutator by the movement of the rigging.

618,864. Apparatus for Operating Electric Brakes. Herman S. Graber, St. Louis, Mo. Application filed July 25, 1898.

A circuit in which a storage battery and an electric motor are arranged in series, a second circuit leading to and from the battery and which receives no electricity from the first circuit; a series of electromagnets permanently out of circuit with the motor arranged in the second circuit, and means for opening and closing the latter circuit, are features of the invention.

618,876. Circuit Breaker and Closer. Alva T. Hill, Detroit, Mich. Application filed June 8, 1897.

The combination is claimed with a track circuit and an independent signal circuit, both normally open, of an electromagnet arranged in the track circuit, an independently operating motor, a circuit-closing device actuated and controlled by the magnet, the device being adapted to be driven positively by the magnet upon the closing of the track circuit into the signal circuit to close the latter; means for automatically and positively locking the closing device in the signal circuit, means operating independently of the magnet for withdrawing the closing device from the circuit when on locked, a tripping device operated and controlled by the motor, adapted to release the closing device and an automatically operating starting and stopping device for the motor.

618,911. Trolley Connection for Canal Boats. Frederick J. Shewring, Toronto, Canada. Application filed February 7, 1898.

The trolley consists of a frame embracing in its construction two vertical members, each member composed of two opposite sides united at their upper ends, a depending arm from each vertical member at one side thereof, bent horizontally below the wheel and then perpendicularly, a counterbalance connected to the lower ends of the depending arms, a rod connected to the arms above the counterbalance having a ring loosely mounted thereon, a swiveled trolley pole connected to the bar, and a flexible electrical connection between the sliding ring and trolley pole.

618,935. Rotating Electric Motor. Warren P. Freeman, New York, N. Y. Application filed February 25, 1898.

The motor is mounted to turn or rotate upon a support or standard; there is a set of ball bearings between the motor and the support or standard and two movable contact connections lying inside of the circle formed by the ball bearings and connected with respective terminals of the circuits of the motor.

618,950. Lightning Arrester. Eugene C. Parham, Johnstown, Pa. Application filed June 26, 1897.

The movable plunger has a magnetizable electrode at its end, and a second electrode is adjacent to and separated from the magnetizable electrode; a contact member is carried by the plunger, and a contact member in the line of movement of the contact member, each of the contact members being in electrical connection with one of the electrodes.

618,992. Cleaner for Commutators. John T. Morrow, Great Falls, Mont. Application filed September 29, 1898.

A cleaning device is described combining a frame, means for movably supporting thereon cleaning fabric or material, one or more presser rolls over which the material passes, one or more bearing blocks movably mounted to the frame and carrying the roll or rolls, and means for yieldingly passing the block or blocks toward the surface to be cleaned.

618,993. Electrical Battery. Leonard Paget, New York, N. Y. Application filed July 8, 1897.

This battery has a metallic retaining vessel, in combination with a metallic electrode which fits snugly within the vessel, the electrode and the inner surface of the vessel being amalgamated.

619,014. Electric Arc Lamp. Thomas E. Drolan, Chicago, Ill. Application filed December 1, 1898.

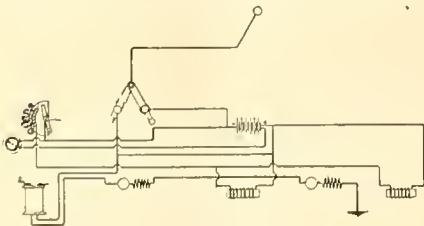
The mounting permits the carbon holder to be moved away from its normal position for trimming, switching mechanism controlling the continuity of the lamp circuit, and a connection between the carbon holder and switching mechanism, whereby the latter is automatically actuated by the movement of the carbon holder.

619,023. Torpedo-controlling Device. Walter D. Litchfield, Somerville, Mass. Application filed August 30, 1897. Renewed November 17, 1898.

A torpedo-controlling device comprising means contained within the torpedo for electrically governing a propelling mechanism, means therein for electrically governing a steering mechanism, two series of electrical contact points having connections with the respective means corresponding to the several evolutions of the torpedo, a multiple switch adapted to have positions whereby the connections may be transferred so that both propelling and steering evolutions are controlled from one series of contact points, a trailer for each series of points, and devices for moving the trailers successively upon the several contact points.

619,028. Electrochronograph. Clark W. Thomson, La Crosse, Wis. Application filed June 27, 1898.

A notched wheel is attached to the hour-hand arbor, a pin is carried thereby; the toothed wheels are adapted to be operated by the wheel by means of the notch and pin, which a hollow arbor carries an index hand and index, and an electromagnet, adapted to set the operative mechanism in motion when a current is flowing through the magnet, and to stop the operative mechanism when the current ceases to flow through the electromagnet.



NO. 618,864.

619,038. Automatic Electric Signal for Railway Crossings. Urias J. Fry, Milwaukee, Wis. Application filed September 26, 1898.

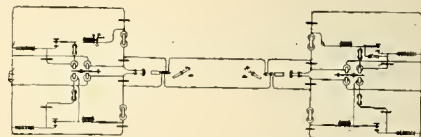
In signal apparatus for the protection of a crossing or danger point on a line of railway, the combination of a local circuit including a signal and source of current, primary and secondary switches each arranged to close the circuit independently of the other, primary and secondary magnets for operating the switches, a detent normally holding the primary switch open, a releasing magnet for disengaging the detent and permitting the switch to close, a circuit including the primary switch arm, the detent, the releasing magnet and a source of current and adapted to be closed by a train approaching the crossing or point to be protected, and another circuit adapted to be closed by a train at or near the point to be protected and including both the primary and secondary magnets and a source of current.

619,090. Electric Arc Lamp. Albert Schweitzer, Allegheny, Pa. Application filed June 7, 1898.

In an arc lamp the combination of a central support or column having a plate secured thereto, an electromagnet and dash pot mounted on the plate, a cross-beam connecting the magnet and dash pot, a rod or bar pivotally secured to the dash pot and connected to the upper carbon holder whereby a steady feed of the upper carbon to the lower carbon is attained.

619,091. Automatic Magnetic Circuit Breaker. William M. Scott, Philadelphia, Pa. Application filed January 28, 1898.

In an automatic magnetic circuit breaker having fixed and movable contacts, in combination with means for effecting the separation of the movable contacts from the fixed contacts, means for restraining the operation of the separating means until actuated to permit the same, means for actuating the restraining means, and an electromagnet and armature for controlling the actuating means during predetermined flow of current through the magnet, and a pivoted lever adapted to be manually operated to force the armature into engagement with the poles of the magnet.



NO. 619,157.

619,100. Electric Crane. William R. Thomas and James Thomas, Catauqua, Pa. Application filed June 6, 1898.

In a boom crane the combination with a supporting car of a boom mounted thereon, a power shaft carried by the boom, two counter shafts mounted on the boom, means connecting one counter shaft with mechanism for moving the car, means connecting the other counter shaft with hoisting mechanism, loose gears mounted upon the power shaft, means connecting one loose gear with one counter shaft, and means connecting the other loose gear with the other counter shaft, the loose gears having frictional cups upon their adjacent faces, a double clutch splined to the power shaft between the loose gears, and means for reciprocating it so as to bring it into engagement with the friction cup on one or the other loose gear according as it may be desired to actuate the car-propelling mechanism or the hoisting mechanism.

619,157. Composite Signaling and Transmission System. Stephen D. Field, Stockbridge, Mass. Application filed December 24, 1897.

A composite system of one telephonic circuit and three telegraphic circuits is formed of two main conductors, the conductors serving severally as the line conductors of two of the telegraphic circuits, being connected in parallel to constitute the third telegraphic circuit, and being connected in series to constitute the metallic telephone circuit.

619,187. Prepayment Mechanism for Electric Meters. John C. Kinney, San Antonio, Texas. Application filed April 18, 1898.

The first claim is for the combination with a meter and the main circuit for its coil or coils of a normally open circuit closer included in the meter circuit, a magnetically controlled means for respectively opening and closing the circuit closer, a coin-controlled device for setting into action the means for closing the circuit closer, and a separate device for setting into action the means for opening the circuit closer.

619,217. Electric Motor. Oscar H. Pieper and Alphonse F. Pieper, Rochester, N. Y. Application filed March 21, 1898.

An annular magnet for motors is employed embodying two sections, each composed of separate plates secured together and having the projections forming the interior jobs pieces and the exterior depressions, the ends of the plates lapping, means for securing the lapped ends together, and the bearing plates on the magnet opposite the exterior depressions.

619,249. Toll Counter or Register for Telephonic Circuits. George K. Thompson, Malden, Mass. Application filed June 21, 1898.

In a registering apparatus two straight electromagnets are provided, one being relatively sluggish in operation, both having armatures pivoted to swing at a right angle to the poles thereof and to hang away therefrom by gravity; the one having a projection adapted to lie in the path of the second and lock the same when so retracted and the latter terminating in a pawl or escapement, with a counter mechanism provided with a ratchet wheel.

Western Electrician

EVERY SATURDAY.

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No. 8

Effect of Electrical Discharges on Photographic Plates.

Interesting results may be obtained by the disruptive discharge of the high-potential current of a spark coil on a glass photographic plate treated as a condenser. The pretty effects of the photographs—if such they may be termed—herewith reproduced were obtained in this manner by Mr. Clyde H. Thompson of Chicago. The apparatus required for the experiments is simple and it affords a pleasant scientific entertainment, while giving some results that are not easily explained.

Mr. Thompson used four storage-battery cells and

film with the negative wire at the point from which the paths of discharge radiate. This picture is a fine representation of an artificial discharge of lightning, and it is surmised that in the lightning flashes of nature there is a myriad of branches and still finer tentacles from the main path of discharge, not visible to the observer in the instant of sight, but nevertheless existing in the manner generally indicated, by this picture.

The beautiful result secured in Fig. 3 was obtained by placing a Columbian half-dollar on the film and reversing the connection—that is, connecting the tinfoil on the glass side with the negative wire and touching the coin with the positive wire. The

of the plate and touched with the negative wire to produce the effect in Fig. 5 (page 166). It will be noticed that the lines of force from the four arms of the cross appear to repel each other, as in a magnet. The lines of demarcation from the neutral point where the arms cross are distinct. At the left is a curious positive discharge.

In Fig. 6 a coin was placed within the bell of Fig. 1 and the negative wire was brought to the bell as before. There was but one discharge, but the positive and negative characteristics are both present—the positive within the metal rim, in the direction of the coin. The metallic bodies appear to show the effects of mutual induction. The equality of the

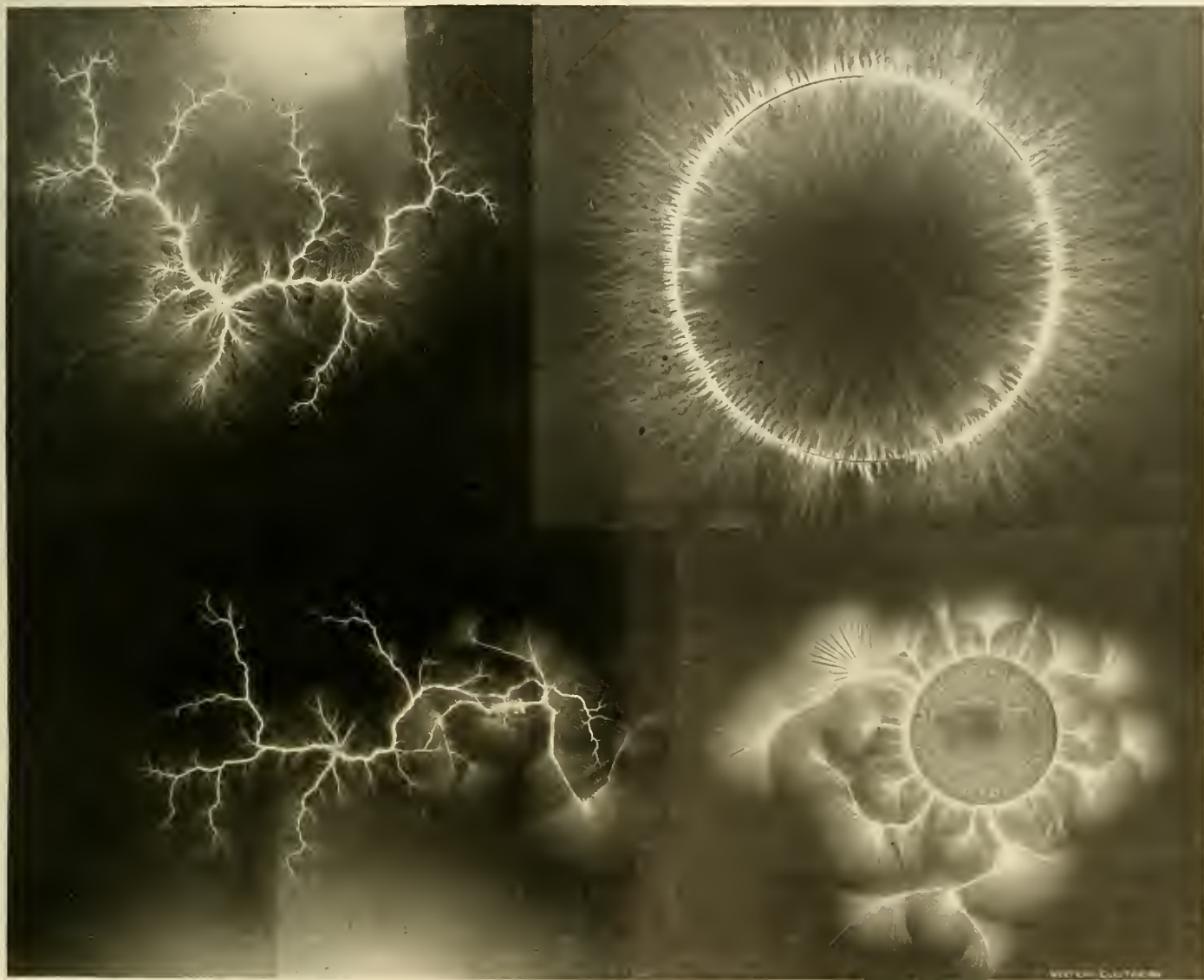


Fig. 2.

Fig. 4.

Fig. 1.

Fig. 3.

EFFECT OF ELECTRICAL DISCHARGES ON PHOTOGRAPHIC PLATES.

an induction coil capable of giving an eight-inch spark. The experiments were, of course, conducted in a dark room. Five-by-seven-inch glass photographic plates were used. The glass side of each plate was backed completely by tinfoil connected to one side of the spark-coil circuit. The discharge was obtained by making a connection between the other wire of the spark-coil circuit and the film side of the glass plate.

In Fig. 1 a small electric bell was placed on the film side of a plate treated as described. The positive wire was connected with the tinfoil beneath and the bell was touched with the negative wire. The plate was then developed, and the print from it showed the result in the reproduction.

Fig. 2 was obtained by touching the surface of the

resulting palm-leaf or fan-shaped discharge is termed the positive discharge, and the effect is very pretty. In this case, too, the side of the coin touching the film was photographed—just how it is difficult to explain, for it must be remembered that no camera or lens was used in the experiments. If it is an X-ray effect, it was secured without a vacuum tube. Perhaps some of the readers of the WESTERN ELECTRICIAN can classify the phenomenon.

Fig. 4 shows the effect of two discharges on one plate—negative at the left and positive on the right. It is interesting to observe the contrasting characteristics of the two discharges—the forked lightning of the negative and the palm-leaf shape of the positive.

A cross made of tinfoil was placed on the film side

discharge in all directions outside of the rim is to be noticed in the bell pictures.

Fig. 7 is similar to Fig. 3, only the coin on the film was touched by the negative wire instead of the positive wire. In addition to the general radiating discharge, a distinct and strongly marked path of discharge is seen in this picture. No reason for this is given.

The War Department, through the Corps of Engineers, is inviting sealed proposals until March 6th, for furnishing and installing an electric-lighting plant at Fort Preble, Me. Specifications and full information will be furnished upon application to Major S. W. Reessler, 537 Congress street, Portland Me

Electric Cabs in New York.

There seems to be no doubt remaining of the success of the electric-cab service in New York. The company supplying it, the Electric Vehicle company, is arranging to place orders for the construction of 200 more cabs. There are to be 25 of the ordinary coupe pattern, 75 hansom cabs, 50 full-extension broughams seating four persons each, and 50 three-quarter-extension broughams accommodating three persons each, the last two being new styles of vehicles. All are to be delivered by June 1st. A new building in Forty-second street, near Third avenue, is to be used as a construction and repair shop, and



FIG. 5. EFFECT OF ELECTRICAL DISCHARGES ON PHOTOGRAPHIC PLATES.

a charging station is to be built downtown and another on the East Side, the company to operate 100 vehicles from each station.

Engineers in other cities will be interested in the report of Mr. W. F. D. Crane's remarks to the New York Electrical society, which visited the station of the Electric Vehicle company at 1684 Broadway on Tuesday of last week. Mr. G. H. Condict, the chief engineer of the company, was to have given the society a paper on "The Automobile Situation and Prospects," but was detained in Philadelphia by the storm. In his absence Mr. Crane consented to make a brief address. Mr. Crane said:

"Mr. Condict had prepared an address giving figures and details of operation and some of the results of his rather large experience in the manufacture and handling of these vehicles, which I cannot hope to furnish you; and all that I can do in these brief remarks is to attempt to explain partially what the electric cab or vehicle is, and explain something about its operation, the handling of the batteries, etc.

"As your president has remarked [Mr. Dunn had made a brief opening address], the body of the vehicle, as it appears upon the wheels to-day, is what we got from those who have gone before; it is a work of the past. The running-gear below is a little more up-to-date. In this matter the engineer is confronted with the fact that he is trying to combine the old with the new. The body is not connected with the running-gear below, and so far the running-gear below is inadequate for the service required of it. But if some radical change were made in the appearance and shape of that body—if a vehicle very different in appearance from what you see here should be put upon the streets—the people generally would probably criticize it for being queer; and yet we can expect, as the natural development of the vehicle goes on, to have what would now seem queer shapes appear upon the streets, and they will no doubt start a new fashion in vehicles.

"One of the difficulties that must be faced in designing the mechanism to run the cab or carriage is the spring-body. You must have a running-gear—truck, wheels, axles, whatever you call it—below, fairly rigid and stationary to receive your machinery, and at the same time make all allowances for the spring motion which contributes to the comfort of the rider. This carriage at present does not seem to follow any known laws of ordinary machines, where things are made rigid and fast. For example, when these cabs leave this building, and they are obliged to make a quick turn, the front wheel will go on to the roadway, and the other three wheels will remain on the sidewalk, meaning an elasticity throughout all the lower part of the vehicle; whereas the old-fashioned springs take the weight of the vehicle the best way they can. Changes are under way to modify the lower structure as to make it stronger and more durable. I suppose every electric carriage in the United States to-day is going to speed, and one of the first things to be done is to make the vehicle so that it will not go to pieces. All wear and the electric-vehicle manufacturer is going through the same stage that the street cars did

in times past, when everything went to pieces and would not stay together.

"I suppose you will be most interested in the way in which the motors, batteries, switches, etc., are combined in the vehicle. The motors are placed upon the axle, two of them in the case here, with the gear rigidly fixed upon the wheels. These wheels are not rigid with the axles, but are independent. The pinion upon the motor comes out and meshes with the gear which is attached to this wheel; so you can imagine the result if one motor ceased to revolve and the other did—the thing would spin around. The steering arrangement is applied to the hind wheels. The axle does not turn with the wheels, but the wheels are arranged upon separate spindles, which are hinged to the axle, which is rigid with the body attached to the springs. The wheels are steered by the steering mechanism, so as to produce the steering action.

"The batteries are placed within the cab, either from the front or rear, dependent upon the character of the vehicle, whether a brougham or hansom. These batteries, when shoved into the vehicle, make automatic contact, so that the operator has nothing to do except to put the door over the compartment. The motorman, or driver, as he is still called, has everything within hand-reach or foot-reach at his side. With his hands he operates the controlling lever for operating the switch beneath his seat; he also steers with his hands. The braking is done with his foot, and he rings the bell with his foot. There is an emergency switch placed near his heel, by which he can throw out the switch and break the current in case it is necessary to do so. In order that no tampering with the vehicle can take place while he is absent, he can remove the lever, so that the machine cannot run away if an idle boy attempted to fool with it.

"One of the difficulties that appears in this par-

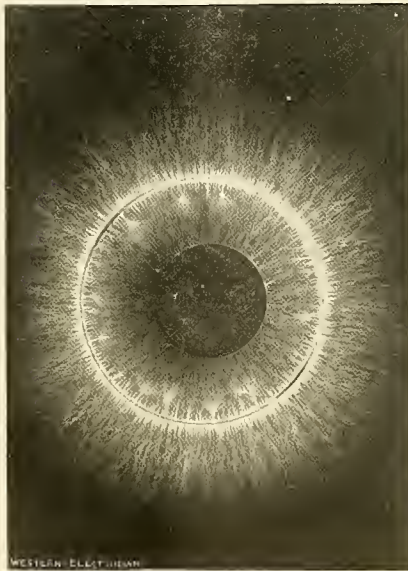


FIG. 6. EFFECT OF ELECTRICAL DISCHARGES ON PHOTOGRAPHIC PLATES.

ticular line of work, as it does also in storage-battery practice for other classes of work, is that when you place the batteries within the vehicle—these batteries weigh between 1,300 and 1,500 pounds—the vehicle sags. For that reason you will notice later, when you inspect the batteries and table below, there is an arrangement to lift the body of the vehicle so as to bring the floor of the battery compartment on a level with the table over which the batteries come. This feature has been most ingeniously worked out here, and I think I am right in saying that Mr. Condict deserves the greatest credit for the ingenuity he has shown in designing the various movements for the handling of these heavy batteries quickly, economically and satisfactorily, for, of course, the batteries, which take the place of horses, fuel, steam and all other methods of propulsion, are the essential elements in the whole problem. You will see the batteries picked up and carried around sideways, backwards and frontwards, as if they had no weight at all; but when you think of their weighing almost three-quarters of a ton, you can readily appreciate that it took some ingenuity and requires a great deal of strength in the batteries to handle them so quickly and easily. In street cars run by storage batteries, one of the early difficulties was to get the car to a position where you could put in the battery. The same thing occurred with the electric cab, but the difficulty has been overcome by that table [indicating], on which the cab stands.

"The table is split in two parts, and balanced below, so that the parts are free to move in either direction sideways. The cab enters and takes its position on any part of that table; then levers forced by hydraulic cylinders on the sides come up and engage the hubs, and make the movement which forces the cab in a right line from the table. This is a great improvement and a vast step in this business—to conceive such a remarkable way of aligning the carriage with the battery which is to

enter it. While this is going on, you have the jacks coming up under the floor of the table, also operated by hydraulic power, to raise the carriage to the level of the table. Meanwhile, the batteries, which have been charging on the tables further on behind, have been brought forward by the crane.

"The operation there seems very simple. While the cabs are on the street they are using the charge which has been put into the batteries. When they come back they require a new charge. The cab or carriage as it enters upon this table is centered as described, and raised to the proper level, and a hydraulic ram comes out, takes hold of the batteries and pulls them out so far that they are left on the table, which carries them sidewise. These batteries are then moved out of the way, and a set of batteries which has been charged and which is resting upon the table is brought opposite the opening in the cab, and the ram forces the batteries into the carriage. Then the set which has been exhausted is picked up by the jaws, carried down the length of the room and deposited upon a table, where it will be recharged and made ready for service next time.

"The operation of the station here is certainly most fascinating. I think you could all come up here—you who are interested in mechanical problems—and sit upon this balcony several times a week and watch the loading and unloading take place, and find it always a matter of interest to you. There is a great deal to be improved upon, of course, although it would appear now as though the shortness of time required to load the vehicles could not be very much reduced. The other evening a cab came in, the old battery was taken out and a new one put in in a minute and a quarter. This is prompt work, and it would be impossible to unharness horses and harness them again in that time. That is one of the modern advances.

"Mr. Mailloux suggests that something be said about charging the batteries. When the batteries are let down on the table, they are moved by automatic contact by jaws coming up on the side. On the battery boxes are contacts which fit similar contacts in the cab and also the contacts upon these tables. As the battery falls the contacts are driven up on the side, and the contact is automatically made with the switchboard, and the charging takes place in the regular way."

The "Cape to Cairo" Telegraph.

Mr. Cecil Rhodes, the noted advocate of British expansion in Africa, is exerting himself to the utmost to bring about the accomplishment of two great projects—a north-and-south railway running the whole length of Africa, "from the Cape to Cairo," and a line of telegraph connecting the same points. These schemes, while necessarily related to some extent, are yet distinct. The transcontinental telegraph is practically Mr. Rhodes' own private enterprise. The greater part of the cost is paid from his own pocket, and the scheme can be completed without public help. The transcontinental railway is a design of greater magnitude. The expense of building a railway is much more considerable than that of constructing a telegraph line, and it is estimated at \$50,000,000. Recognition and assistance



FIG. 7. EFFECT OF ELECTRICAL DISCHARGES ON PHOTOGRAPHIC PLATES.

from the government will, therefore, greatly facilitate the rapid execution of the railway enterprise. But the telegraph line is now believed to be within three years of its completion, and though the course of telegraph and railway will not be absolutely identical, the knowledge of the country which has been acquired in the construction of the telegraph line will be of great service in the building of the railway line.

In a late article in the London *Times* it is stated that the total length of telegraph wire, which will stretch from the Cape to Alexandria when telegraphic connection with the Egyptian system has been made, will be 6,666 miles. Of this the Cape system to Mafeking supplies 870 miles; the Egyptian

system, if carried to Fashoda, will supply 2,000 miles. Upward of 3,500 miles represents the gap in the connection left for Mr. Rhodes and the Chartered company between them to fill. The Chartered company is responsible for a section from Mafeking through the southern portion of its territories. The African Transcontinental Telegraph company, of which Mr. Rhodes is the founder and principal shareholder, has undertaken to construct 2,725 miles, connecting Salisbury, the capital of Rhodesia, with the southern boundary of the Sudan. Thus the whole telegraphic system between the Cape and the Mediterranean coast is divided into three sections—the South African, the North African and the Transcontinental.

The principal stations of the Transcontinental telegraph line from Salisbury northward will be Tete, on the Zambezi; Blantyre, the capital of Nyassaland; Karonga, at the north end of Lake Nyassa; Abercorn, at the south end of Lake Tanganyika; Pamlilo, on the western shore toward the southern end of Tanganyika, where British Central Africa meets the border of the Congo Free State; Uvira, in the Congo Free State, near the north end of Lake Tanganyika; Fort George, upon the northwestern shore of Lake Albert Edward; a point not yet decided at the southern end, and another at the head of the Albert Nyanza; Lado, Abu-Kuka

ward Heaton, Harry Robert Benda, Marcus B. Waterman, J. A. Lynch, Bartow V. Van Voorhis, Jr., Henry Drucker and Harry N. Ramsey.

Northwestern Elevated Railway.

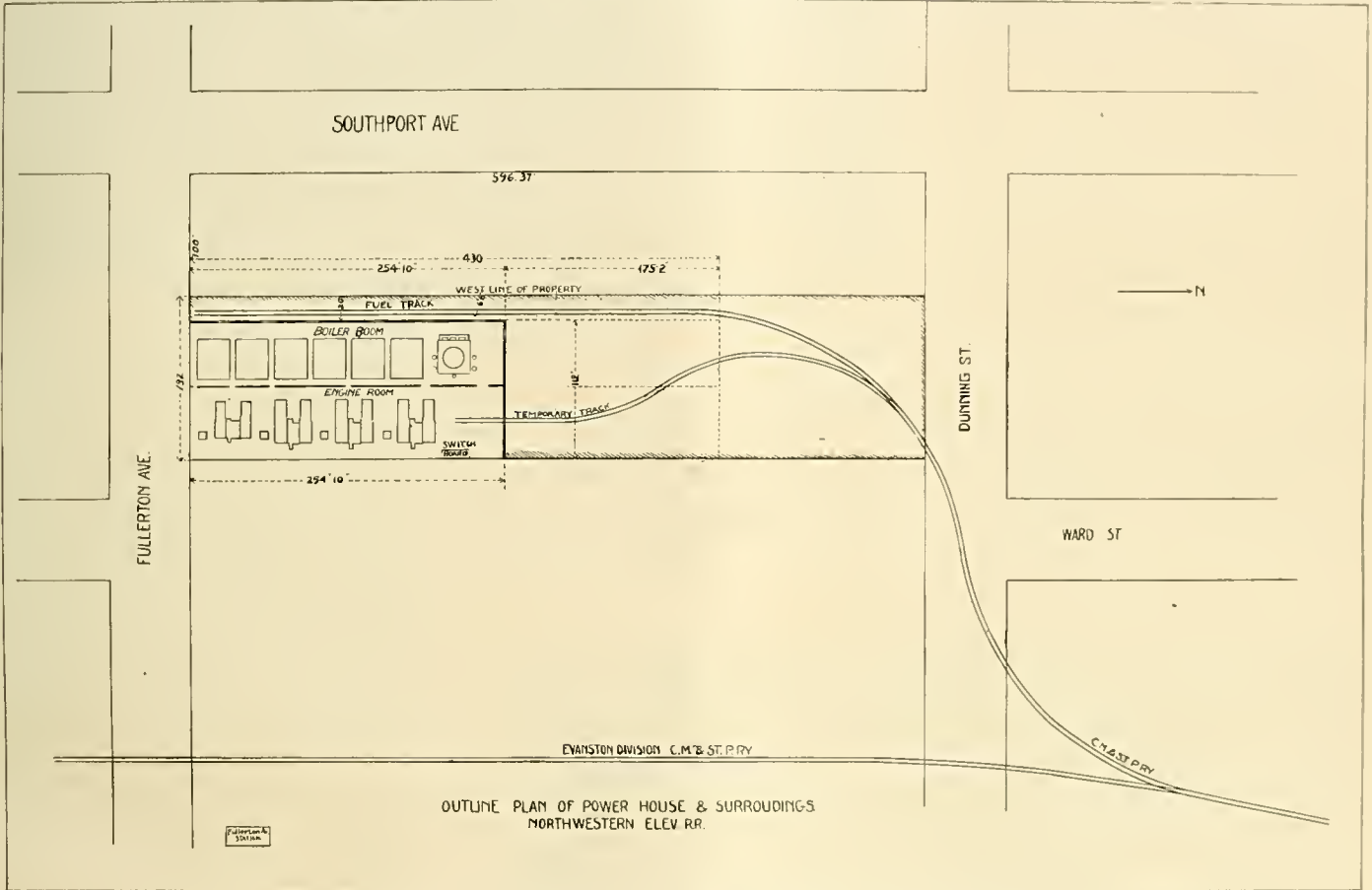
About half of the Northwestern Elevated Railway company's track structure has been erected on the streets of the North Side, Chicago. The structural iron for the remainder is being finished in the shops and will be put up this summer. In the meantime work has been begun on the site of the power house in which the electrical energy to operate the trains will be generated. This plant has been located on Fullerton avenue, near the corner of Southport avenue. A plan of it and an outline map of the surroundings are given herewith. The power house will be 3,000 feet from the nearest point on the elevated structure, at Fullerton and Sheffield avenues, and the connecting feeders will be laid in conduits in Fullerton avenue. The site was selected for convenient access to fuel and water. The coal will be taken from cars or tracks of the Chicago, Milwaukee and St. Paul railroad, and water for condensing is to be obtained from a 12-foot conduit in Fullerton avenue, through which the city pumps water from the lake to create a current in the North Branch of the Chicago River. The power house will be a single-story rectangular

Electricity on Board Ship.

By S. DANA GREENE
PART II.

As between steam and electricity steam has the following disadvantages:

First—Danger to life. The bursting of a steam pipe, whether in or out of a fight is a serious matter and likely to disable any of the crew who are in the compartment where the accident occurs. It has been abundantly proven in our Civil War that men will not stand up against steam or hot water, when they will face shot and shell without flinching. Many of our vessels operating in inland water during that war had several lines of hose coupled to a hot-water tank and laid out every night to guard against boat attacks. These hoses were successful on more than one occasion in repelling boarding parties. While the main steam leads fore and aft can be run below the protective deck or behind the armor belt, vertical branches must run to all auxiliaries on the upper decks and many of these must be used in action. The effect of a steam pipe carrying 100 pounds pressure bursting or being shot away, in a compartment where there may be 30 or 40 men at the gun or passing ammunition, would undoubtedly be to kill or disable every man in the neighborhood and demoralize thoroughly that part of the ship. On the



NORTHWESTERN ELEVATED RAILWAY.—PLAN OF POWER HOUSE AND SURROUNDINGS.

and Sobat, upon the Nile. There are intermediate stations of which the names are even less familiar to the public than these which have been cited, and the line will be divided into sections averaging about 200 miles in length, with an inspector and an efficient staff of linemen to every station. Branch lines will also be constructed to important points, as, for instance, from Fort George to Uganda on the one side and to Stanley Falls upon the other, and from Uvira, at the head of Lake Tanganyika, to Mwanza, at the foot of Victoria Nyanza. The portion of the line which is now completed and in working order is from Salisbury to Karonga, at the north end of Lake Nyassa. A message was recently received at Cape Town from Karonga within three hours of its dispatch. The section from Karonga to Abercorn, at the south end of Lake Tanganyika, is nearly finished, and the further section to Pamlilo, on the Congo Free State border, has been surveyed. One object of Mr. Rhodes' journey to Egypt is to obtain permission to start simultaneous work upon the telegraph line from the northern end at Sobat, whence material for construction can now be more readily conveyed than it could be from the southern end. Construction will at the same time be pushed on from the south, and the two ends will presumably meet at Fort George, upon Lake Albert Edward.

New York Electrical Society.

Last week's meeting of the New York Electrical society was held in the station of the Electric Vehicle company and the members listened to an address by Mr. W. F. D. Crane, one of the company's engineers. The following-named new members were elected: E. S. Keefer, Walter F. Wells, Robert O. Bacon, Ed-

ward Heaton, Harry Robert Benda, Marcus B. Waterman, J. A. Lynch, Bartow V. Van Voorhis, Jr., Henry Drucker and Harry N. Ramsey.

brick structure 112 feet wide on Fullerton avenue and 255 feet deep. It is planned for an engine capacity of 7,000 horse power, but the location and capacity of the stack permit of an extension for 5,000 horse power to be easily made in the rear, as shown by the dotted lines on the plan. The walls of the building will be 49 1/2 feet high, and the octagonal stack, built of brick, will be 203 feet high, with a 16-foot flue. The stack will rest on a foundation of piling, which is now going in. The roof will be flat and of concrete.

A longitudinal brick wall divides the station into boiler and engine rooms, the former 50 feet wide and the latter 58 feet wide. The boiler room will contain 12 boilers, each of 400 horse power, arranged in six batteries. Water-tube boilers, made by the Babcock & Wilcox company and fired by Murphy furnaces, will be used, and a complete coal and ash-handling plant will be provided, with outside and indoor storage bins for coal. In the engine room there will be four direct-connected engine-dynamo units—three of 1,500 kilowatts each and one of 800 kilowatts. The engines will be cross-compound, condensing, slow-speed Corliss, built by the Atlas Engine Works of Indianapolis. They will drive Siemens & Halske generators having internal armatures—the first machines of this type to be built by this company. The larger units will turn at 75 revolutions per minute and the smaller one at 80 revolutions. Two 35-ton overhead traveling cranes, built by the Walker company, will span the engine room. The switchboard will be of the usual type.

Mr. J. R. Chapman is the designing and supervising engineer for the power-house plant.

other hand, if a wire is shot away one or more auxiliaries may be disabled but no one is injured; furthermore, the wire presents a much smaller target than a steam pipe, and is, therefore, less liable to injury from shot. It is always a difficult matter, too, to keep steam and exhaust pipes tight and to prevent leaks at the joints and at water-tight bulkheads.

Second—Injurious heating of living quarters. Steam and exhaust pipes must necessarily run to every auxiliary, and some of the latter, such as the ice machine, anchor hoist, steering engine, ventilators, etc., are in the officers and men's quarters, or the pipes leading to them must pass through these quarters. The heat of the pipes and engines not only makes the quarters uncomfortable, but it is impossible to prevent more or less oil and dirt around the auxiliaries. In the tropics, the heat is often so great that the officers and men cannot sleep below at all. This was the case on a number of our vessels operating in Cuban waters last summer.

Third—Efficiency. Here the contrast is very striking in favor of electricity, surprisingly so to one who has not seen the actual economy figures of steam auxiliaries. Some data will be presented on this subject later on.

There remain the two important factors of simplicity and reliability to be considered. No one who has had experience with the modern, well-designed and well-insulated carbon-brush generator or motor can have any doubt as to its greater simplicity as compared with the steam engine. There are no joints to keep tight, no nuts or bolts to set up, no packing to renew, no cylinders to cut, and only two self-oiling bearings, as compared with a dozen or more oil

cups on an engine. In fact, it is difficult to imagine a simpler piece of machinery than the modern dynamo. It seems like a return to elementary principles to discuss such a point; and yet many men aboard ship imagine the dynamo a most complicated affair, simply because they know nothing about electricity and think everything connected with it is mysterious and complex. This feeling is not confined to seafaring men, as we all know.

The question of reliability is a vital one, for no matter what the advantages with respect to safety, economy and simplicity may be, if the electric auxiliary cannot be relied upon at any and all times to do its work it is a failure and must be discarded. It must not only be able to work well under normal and favorable conditions, but it must also be able to stand a certain amount of abuse and neglect. Stress of weather and other conditions, particularly during a war, sometimes play havoc with the established routine of a ship, and the sailor's tools must not only be sound; they must be hardy. The normal conditions aboard ship are not favorable to ordinary electrical apparatus, as has been explained, but this simply means that apparatus for such work must be specially designed and built to meet these conditions. The ordinary motor would not last long under a street car; nevertheless, thousands of car motors are built and sold every year which run day in and day out with a remarkably low maintenance account. Similarly, apparatus for ship work must be specially

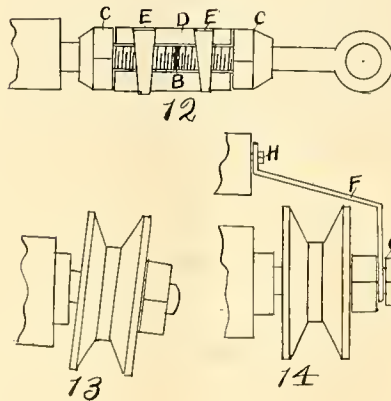
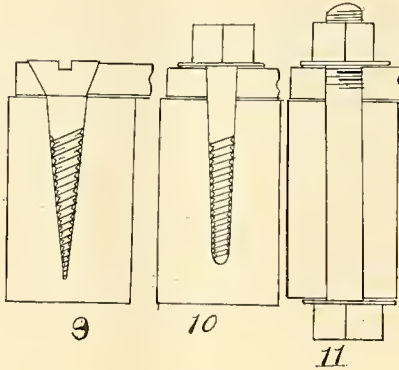
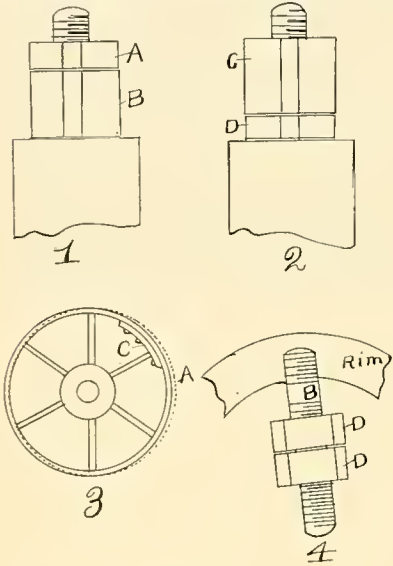
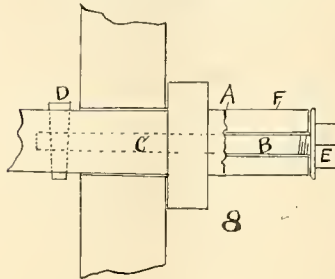
Electrical Shop Practice.

By B. F. FELLO.

The high speed at which some types of electrical machinery are run necessitates the use of lock or jam nuts to check the set nut and prevent its working loose. I have noticed that many electrical machinists make the mistake of putting the lock nut in the wrong position, as in Fig. 1, in which the set or regular nut is marked *B* and the thinner nut, which is the check nut, is marked *A*, and is on top. The thin nut can be smaller in diameter if necessary, and its thickness need be only sufficient to allow enough threads to get a firm hold on the bolt. This nut, practically speaking, is the check nut, and its rightful position is second from the end of the bolt, as at *D*, Fig. 2. It answers entirely as a check nut in this position and is subject to no strain or weight. The threads of the top nut *C* sustain the weight and strain, and this nut must be of full proportions.

BALANCING DRIVING PULLEYS.

Another little "kink" that is of more or less importance in the electrical-machinery line is the bal-



ELECTRICAL SHOP PRACTICE.

insulated, a larger margin of capacity must be allowed, and in exposed places it must be thoroughly inclosed. Several years ago an English manufacturer asked permission to install an electric deck winch on the spar deck of a new cruiser fitting out at Portsmouth. When the captain, who was superintending the fitting out of the ship, saw it, he gave orders to have the deck hose turned on the motor for 10 minutes, and then to operate the winch. The manufacturer protested and said that the motor was not intended to be abused in that way. "Then take it off the ship," said the captain, "for I cannot guarantee that we will ship no seas during our cruise, and I want that winch ready for service whether the ship seas or not." The captain was quite right. The motor was taken off and a "rough-and-ready" gear motor substituted.

Experience alone is the final test of reliability, and fortunately we have some experience in our navy on which to rely. During the late war all of our regular war vessels were fitted with electric-lighting plants, and many of the larger ships were supplied with electric fans and ammunition hoists. Two of the Brooklyn's turrets were controlled by steam motors and two by electric motors. So far as I have

ancing of pulleys on dynamos or motors. The writer knows of cases in which some very excellent electrical machines failed to run satisfactorily simply because of the poorly balanced driving pulley. If the pulley is but very little out of balance, the high speed of the machine will add to the defect, often throwing the whole machine out of line. Humming, heating of bearings, rattling of parts and general disorder will result if the wheel is not attended to. In one shop they had a direct-driven multipolar dynamo running with a driving pulley so far out of balance that the floor under the machine was shaken at each revolution. This was remedied by locating the light side of the pulley and riveting on a piece of metal inside the rim, as at *C*, Fig. 3. Previous to putting on this weight, the pulley swung as far out of line at each turn as indicated by the dotted circle *A*.

To get a running balance of a pulley, run the pulley to full speed and hold a piece of chalk against the rim. At points which do not take the chalk, and which will probably be all on one side of the wheel, loading is necessary, so as to bring up the weight of that side to balance with the weight of the opposite side. When the chalk marks take completely over the entire rim, the wheel is evenly balanced. Adjustable loading of the light sides of wheels can be done, as shown in Fig. 4,

in which a threaded stud *B* is screwed into the rim of the wheel, from the inside, and nuts *DD* are turned on this stud. As many nuts may be used as are needed to get the right balance.

REPAIRING A BROKEN CRANK-PIN.

In a power plant where a generator was planned for direct connection to an engine, the crank-pin of the latter snapped off close to the crank, as at *E*, Fig. 5. As it was necessary to keep the machinery going, this pin was repaired in about three hours by boring a 1½-inch hole straight through the pin and into the crank. A steel bolt was then turned to fit this hole and was provided with a head *G* at the crank end and a nut *F* at the pin end. When this bolt was tightened up on the head of the pin, the latter was held securely against the seat of the broken portion on the crank, and resulted in a strong piece of work, which has run satisfactorily.

RECTIFYING A WORN PIN.

Sometimes the pin wears off, as at *H*, Fig. 6, after having been in use for a few years. This results in an unsteady motion to the connecting rod, and poor work is done by the machine. The best remedy is to procure a new pin and substitute it for the worn one. If, however, a new pin is unobtainable, the old pin can be removed, placed in a turning lathe and the worn portion turned off true to the shape shown by *I*, Fig. 7. Then a steel shell or sleeve should be turned out and placed over the shaft of the pin, like *J*, thus bringing the diameter up to its original size. This sleeve can be held in place by means of pins *K*.

BROKEN SHAFT OF CYLINDER REPAIRED.

The pulley end of a cylinder shaft broke short off recently, and the way we repaired it is shown in Fig. 8. The remnant of the broken stub of the shaft is marked *A*. The part which broke off was thrown away and plans made for a complete new end. First the end of the shaft was drilled out and cut with a thread to take the two-inch-diameter steel rod *B*. This rod was put into the shaft, as indicated by the dotted lines *C*, and the inner end was wedged by means of the beveled key which passed through shaft and rod. Then a sleeve *F* was turned out and placed over the rod, as shown. This sleeve was turned to the original proportions of the first shaft. Then a nut and washer *E* were placed on to tighten the sleeve and to form a flange for the shaft. This completed the work and resulted in a practical job.

SHAKING ELECTRICAL MACHINES.

There is no electrical machine that can run well if it is not secured firmly to the floor or other foundation. Often trouble with electrical machinery is directly traceable to loose or shiftless connection to the bed. I have seen many fastenings into work floors made with common wood screws, as in Fig. 9. These screws hold well for a time, but they soon work loose and allow the machine to work out of alignment. Almost as bad are the lag screws in Fig. 10, although these frequently serve well for years if the screws are inserted firmly at the start, have a good grip on the grain of the wood, and if the wood itself is in good condition. If the lag screws are put into soft, oily or defective wood they will soon draw out. In Fig. 11 is the plan used by the writer, as a rule, for the reason that a firm and lasting hold can be secured, regardless of the conditions of the wood. A hole is bored directly through the floor and a common bolt is used. The bolt is pushed up through the floor from below and the nut placed on and tightened from above. If the feet of the machine loosen at any time, it is only necessary to tighten up the nuts.

BROKEN CONNECTING ROD.

Fig. 12 shows how a broken connecting rod was repaired recently. The rod snapped off at *B*. The ends of the rod were cut with a thread several inches in each direction, and nuts *CC* were screwed on. Then a case *D* was made from soft steel and the ends slipped into this. Holes were then cut through the case and rod ends for the keys *EE*. The key drew the ends of the rod up, and additional firmness was obtained by tightening the nuts *CC* to the ends of the case, as shown. This rod has been running without springing since it was fixed.

BAND KEPT RUNNING OFF.

The banding on the grooved wheels of an electric arc-lighting dynamo gave trouble by running off occasionally. An examination showed that the strain of the band had bent down the wheel bearing, allowing the wheel to slant, as in Fig. 13. This allowed the band to run off. The remedy was found by taking out the bearing, heating and straightening it, after which it was replaced and further danger of the bearing springing prevented by means of the wrought-iron brace *F*, Fig. 14. The lower end of the brace was bored out to fit over the end of the wheel bearing, just inside the nut *G*, and the upper end of the brace was secured to the frame of the dynamo by a set-screw *H*.

The new government cable across the mouth of the Columbia River, between Fort Stevens and Fort Canby, near Astoria, Ore., was laid two weeks ago under the supervision of Captain Green of the United States Signal Corps. The cable will be used exclusively by the War Department.

(Continued on page 113.)

Niagara in Winter.

By ORRIN E. DUNLAP

This year the ice has caused an unusual amount of trouble in the power development at Niagara Falls, and for days some of the manufacturing plants have had to shut down. In many years the people of Niagara Falls do not recall a time when there were such quantities of ice coming down the river from Lake Erie. The conditions for an ice jam at the falls are cold weather followed by a thaw

Down on the ice bridge a row of shanties was constructed, stretching along the path from shore to shore. One of these was called the "power house," for in it good Canadian whisky was obtainable to furnish "power" for the remainder of the jam across the bridge.

Owing to the shutting off of the electric current for motor use, one of the Niagara Falls daily papers was forced to send its forms to Buffalo to be printed, while another daily paper hurriedly strung a line of wire from a planing mill to its plant, and by this

Underground Trolley Roads in the Storm.

New York, Feb. 25, 1899.

The stoppage of the under trolley cars was explained yesterday by the officials of the Metropolitan Street Railway company, who reported that the power by which the cars are run had been cut off to the wind and the fineness of the snow. The cars simply would not stay where it was put, and the tracks could not be kept clear. Sixty men and sweepers were in operation on the different electric roads, but they were unable to keep any of the lines open for traffic while the wind lasted. Another difficulty the company had to contend with in its fight with the storm was the exhausted condition of its men. Since Saturday morning the men had been working continuously with the sweepers and plows, and, despite frequent relays, many had to give up on Monday.

The good showing of the cable road, compared with the electric lines is not considered by the railroad people as reflecting seriously upon the utility of the under-trolley system, as it is only in the case of unusual storms, they say, that a stoppage of the service would occur. Harry MacDona of the Metropolitan Street Railway company, to whom reporters were referred yesterday, said that at no time during the storm had there been any lack of power on the electric lines, as was shown by the fact that the lights burned brilliantly in cars that were stalled. "The trouble was," said Mr. MacDona, "the wheels could get no grip on the rails. This difficulty is not met with on the cable roads, of course, as the cars are not propelled by the wheels. The cable will drag a car along with the brakes set, so long as a grip is had on the cable. When an electric car strikes a heap of snow the wheels go round but no headway is made. In the usual heavy snowstorm the sweepers can keep a trolley line open, but in the last storm 15 minutes after a sweeper had passed the effect would be scarcely discernible. Then, again, if a car got stalled ahead of a sweeper, the sweeper was put out of commission for the time being. For this reason it was decided late on Monday afternoon to abandon running passenger cars and attention was confined to the sweepers. These had no difficulty in running all night when the passenger cars were out of the way. Twelve sweepers were run on each line with crews of from 12 to 15 men. Only the oldest men in the service are put on the sweepers, as, owing to their enormous power, great experience is needed in controlling them. The sweepers were run about a mile apart. In certain places, however, the sweepers were unable to remove the drifts and men had to be sent out this morning to shovel them away. The worst drifts encountered were on Central Park West, at Eighty-sixth street and One-hundredth street. They were not removed until noon to-day.

"We consider that the under-trolley system has made a better showing in storms than the overhead trolleys, as nearly all the latter stopped running before we did. It happens this year that we have en-



NIAGARA IN WINTER.—ELECTRIC-LIGHT WIRES IN PROSPECT PARK COVERED WITH FROZEN SPRAY.

and high winds. The wind, sweeping down Lake Erie, drives the water and ice into the entrance of the river, where it is caught by the current and carried down stream. The river above the falls is quite wide, and at many places it is shallow, while many reefs abound. It is on these reefs and in the shallow places that the ice lodges and has a tendency to divert the water into the deeper channels toward the center of the stream. With a reduction in the force or a change in the direction of the wind, the water lowers, and then the ice keeps the water out of the inlet canals.

This year, in the case of the canal of the Niagara Falls Hydraulic Power and Manufacturing company, the ice was very troublesome, and day after day it was found necessary to blast it to pieces, and in this condition drive it down the waterway to the canal basin and out the waste gates. Several nights the blasting was continued until morning, and the company's tug was also brought into service to break the ice and hurry it out of the canal. The very severe weather experienced in the Niagara region formed ice very rapidly, and forced a general shut-down of the mills on the canal.

On the Canadian side of the river the cars of the Niagara Falls Park and River Railway company were forced to stop running for days, owing to the lack of power caused by the shutting off of the water supply by the ice.

The WESTERN ELECTRICIAN has described and illustrated the great ice bridge of 1899, and since then the amount of gathered ice in the jam has very materially increased, while the zero weather has formed additional vast fields of ice up in Lake Erie, the greater part of which is expected to pass down the Niagara River and over the falls. The severity of the weather has also had a tendency to solidify the mass of ice now in the gorge, and should there be another great floe come over the falls something unusual is expected to occur. The ice mountain of 1899 will always be remembered as a very novel formation. In size it exceeds any mountain of many years past, and there is no doubt that some of it will be there for the hot summer sun of next July to feed on.

In Prospect Park and on the islands the manner in which the ice gathered on the trees, bushes and shrubs made a very beautiful and never-to-be-forgotten picture. One of the remarkable sights in Prospect Park was the ice formation on the electric-light wires. At Prospect Point the extent of this ice formation excited much attention. From the falling spray of the falls the ice gathered on the wire until it was nearly, if not fully, a foot in diameter, and between the trees right at the point it hung down in a festoon nearly to the ground. Further back in the grove of the park the wires were also heavily covered with the icy coating and appeared like huge cables of white metal. The sides of the trees facing the falls were whitened by the ice until they looked like purest marble, while the other side showed the bark. To walk down through the park to the point and then turn around brought about a transformation scene of wondrous beauty. Prospect Point is now protected by a slender iron railing instead of by the stone parapet wall of old. The ice on the river side of this railing was many feet thick.

means received current from the Buffalo and Niagara Falls Electric Light and Power company. On the Canadian side of the river the electric lights were out for many days, and in Niagara Falls the incandescent service was interrupted.

Electric Launches on the Thames.

The business of charging electric launches on the Thames is growing year by year, says the *Electrical Engineer* of London, and although some of the large suppliers of electric launches have their own stations at different parts of the river, some of the towns on the Thames have arranged that their municipal electric supply shall be available for charging electric



NIAGARA IN WINTER.—ELECTRIC LIGHT WIRES IN PROSPECT PARK WEIGHTED WITH ICE

launches. This is especially so at Windsor, where during the summer a fairly large amount of current is sold for this purpose. At Kingston, where the alternate system of distribution is in use, the charging arrangements are not so easily provided for. Mr. J. E. Edgemo, the engineer in charge of these works, has laid a special armored cable from the works to a small launch-charging house on the riverside. This circuit is supplied from the spare exciter in the station. The arrangements on the exciter panel of the switchboard are such that although any exciter can be put on to this charging circuit, it cannot be switched on to a dynamo while used to excite the alternators. In this way an interruption to the general supply through a fault in the launch-charging station is avoided.

countered two peculiar storms. The first was on November, while not as bad as this, it was very much affected the trolley system because the snow was of such a nature that it froze on the wheels and tracks and dissipated the electricity. This storm was experienced yesterday, the difficulty being due to the high wind, which destroyed the work of the sweepers."

President Vreeland of the Metropolitan Street Railway had this to say:

"We simply couldn't do anything. The cars couldn't get through the snow. The cars got along all right because the snow was blown through the great drifts, where the cars were turned or not. We have had to replace with new ones during the storm."



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DEPARTMENTS.

Table listing departmental articles with page numbers, including 'Correspondence', 'Electric Railways', 'Electrical Securities', etc.

A statement recently credited to Mr. Edison is surprising; but it appears in a daily newspaper and may be accurate. It is contained in the following: There is no year a horse will be a rare sight. The automobile carriage is here to stay. It is now practicable, and will soon be cheap enough for general use. Gasoline will be the motive power, for it is more economical, and a larger supply of it can be carried. Electric storage batteries are too heavy, and besides, they are not practicable. The horse-carriage will also have the good-roads movement. It seems unlikely that Mr. Edison said that electric railways are not practicable. Hundreds of them on city streets prove the contrary. They have their own peculiar advantage, and seem alto-

gether likely to hold the field for pleasure riding on well-paved city streets, where sources of electricity are available. Gasoline vehicles have also their distinct advantages; but if they are to compete with the electric carriages for city use the demonstration has still to be made.

The celebration attending the seventy-fifth anniversary of the establishment of Franklin Institute impresses the observer with the importance of the work of Philadelphia's great citizen. The influence exerted by Dr. Franklin is still a potent factor in the scientific and industrial world. His works have left a lasting impression and his example has proved a guide to many. Dr. Franklin's scientific attainments are only beginning to be estimated at their real value. His qualities as a statesman and philosopher have long been appreciated, but his contemporaries were not sufficiently advanced to recognize the great value of his scientific work

It will not be for lack of means if the Armour Institute of Technology in Chicago falls short of filling the field of usefulness which its admirers see for it. Mr. Armour is very generous. He has just transferred land and securities valued at \$750,000 to the endowment fund of the institution, bringing the latter up to \$2,000,000. The school is now assured an income of \$100,000, and tuition fees may swell the amount as high as \$125,000. A complete course in civil engineering will be established; there are already departments of mechanical and electrical engineering. All friends of technical training will hope that the institution will fully rise to its opportunities.

Of the holding of expositions, like the making of books, there is no end. One of the most promising of the coming events of this character is the Pan-American Exposition, which will be held in or near Buffalo in the summer of 1901. Owing to proximity to the great power-transforming plant at Niagara, a prominent feature will be made of applied electricity, and the display will be of especial interest to electrical men in consequence. The show will undoubtedly be of benefit to the electrical industry, and those interested in electrical pursuits should hold it in friendly regard and help it as they can. The backers of the enterprise are now seeking assistance from Congress and the New York Legislature. Any reasonable request they may make should have the support of electrical men.

Nearer at hand and of less pretension is the exhibition of electrical appliances for household use which will be given in Brussels next May by the Belgian Society of Electricians. This exposition will be held in the new post and telegraph office, Place de la Monnaie, Brussels. It is the purpose of the society to make a complete exhibition of the various uses to which electricity may be applied in the household. Besides devices for illuminating purposes, there will also be exhibited small motors for operating dumb-waiters, coffee-grinders, sewing-machines and other household machinery and for cleaning and polishing shoes, electric heating and cooking utensils, domestic telephones—in fact, all appliances operated by electricity with a view to lightening the labors of the household and to the total suppression of the use of coal for domestic purposes.

Nernst's new electric incandescent lamp was exhibited for the first time in public before the Society of Arts in London on February 8th and at the same time described by James Swinburne. From the brief dispatches of the enterprising London correspondents of the American press, the WESTERN ELECTRICIAN made a brief reference to this important event last week. Now that mail advices from London are at hand, we can describe Professor Nernst's invention somewhat more fully and with greater precision.

In his address Mr. Swinburne first briefly reviewed the history of the incandescent lamp in England, deploring what he declared was the extraordinary neglect of its improvement. "The carbon incandescent lamp has made practically no advance in 15 years," he said. The average electrical engineer really knows little about incandescent lamps and pays no attention to them, according to the lecturer. This seems a rather summary reproof to the engineering profession, and, whatever the conditions

in England, we do not believe that such a sweeping characterization will hold true in the United States.

But, coming to Professor Nernst's lamp, we find that things are altogether different. Mr. Swinburne regards the new lamp as "the greatest invention in electric lighting that we have seen for many years." Professor Nernst is a chemist of the University of Göttingen. He chose as the incandescing material of his electric lamp a substance that would stand higher temperatures than the carbon filament, having, at the same time, the advantage that its specific resistance is so high that strong rods can be used for high pressures. But let Mr. Swinburne describe the lamp in his own words, in abstract:

Nernst takes highly refractory oxides as his material. It does not seem promising, because such oxides are notoriously good insulators. But such insulators are electrolytes when hot; Nernst, therefore, heats the rods to make them conduct, and then heats them electrically, preserving a temperature which is within the limits that the material can bear without softening. Such efficiency also means whiteness of light, so long as the efficiency is not too high. The material is worked up into little white rods. Each rod is mounted on two platinum wires, a little paste made of refractory oxides being applied to the joints. The little rod, with its two wires, is then mounted in a holder which fits ordinary electric-light fittings. As the rods fall in resistance as the temperature increases, after the manner of electrolytes, an increase of current produces a decrease of resistance. This tends to give some instability in running in parallel on supply circuits. This instability is corrected, as in an arc lamp, which has analogous properties due to a different cause, by a series resistance. The Nernst rod has therefore a resistance in series. This is made up of exceedingly fine wire, and for ordinary circuits amounts to 10 or 12 per cent. of the whole resistance of the lamp. The consumption, including the resistance, is 1.5 watts per candle for large lamps and 1.6 for small lights or low pressures. In small or low-pressure lamps the loss of heat at the ends is larger in proportion.

Such a lamp as I have described will not light up of itself, for the rod is an insulator when cold. The simplest way to start it is to warm it up with a match or, better, with a small spirit lamp. Such a lamp as this is not only very cheap as regards first cost, but very economical in running. The life of rods, running at an efficiency of two-thirds of a candle per watt, including the resistance, is already more than 500 hours in good specimens. If the Nernst lamp advances as much in the first few years of its existence as the carbon lamp did between 1880 and 1882, it will soon be made so well that the rods last a lifetime. When the rod is worn out a new rod with its wire mounts is all that is replaced. The whole lamp is not thrown away at all.

The small lamps and the lamps of medium size are in practice started by a heating resistance. This is arranged close to the rod and in shunt to it. As soon as the rod is hot enough to conduct, its current works a tiny cut-out in the resistance circuit. In large lamps the heating system is a little more elaborate, as the resistance arrangement is arranged as a sort of hood which covers the rod. As soon as the rod conducts, not only is the resistance circuit broken, but the electromagnet lifts the little hood clear off the rod. In all these forms, the rod and its mounting are replaceable without interfering with the rest of the lamp.

Mr. Swinburne recognizes the disadvantage of the necessity of heating the rods before they will act as conductors, but suggests the use of an ordinary lamp to show the way to heat and light the new lamps. In lamps of from 20 candle power to 200 candle power, and even smaller lamps, in which it is worth while to have automatic ignition, the first cost will be higher than the first cost of incandescents, but as the rod itself has alone to be replaced, that is considered a matter of very slight importance. "This size of Nernst lamp," says Mr. Swinburne, "has, further, every chance of completely ousting the carbon incandescent on the score of cheapness, as to renewals, higher efficiency, better colored light, and perhaps more especially high pressures. Once the Nernst lamp becomes so general that systems of distribution are laid out to suit it, instead of to suit the carbon lamp, the carbon lamp is practically out of the running." In large sizes it is said that the Nernst lamp will compare with the arc lamp in efficiency and be cheaper in first cost and maintenance. As to pressure, lamps may be worked at 500 or, by using double rods, even 1,000 volts, if desired. The sample lamps were operated on an alternating-current circuit, but Mr. Swinburne said that they would work with continuous current.

Mr. Swinburne was very sanguine of the new invention, but he thought not too sanguine. On this side of the water we shall need further demonstration and explanation before sharing his enthusiasm to its full extent.

Public Supervision of Private Business.

By FRANKLIN H. WENTWORTH.

The bill to provide for municipal supervision of gas and electric-light companies, which has been introduced in both houses of the Illinois Legislature, has not a single reasonable or justifiable feature to commend it. Indeed, it is difficult to determine from its perusal whether its sponsors are merely stupid or whether they are offering the bill with the expectation of possible personal profit. It is a pitfall for the thoughtless, being ostensibly in the interest of the people, just as were the bills which formerly were with great regularity introduced for the professed purpose of lowering Pullman sleeping-car rates, but were never enacted, for obvious reasons.

That the present measure is not really in the interest of the people is apparent. It makes it imperative for every village and city of the state to appoint what it calls "gas and electrical commissioners." It provides that their salaries (not less than \$500 nor more than \$2,000 per annum) and those of their assistants, together with their office rent and expenses, shall be paid out of the municipal treasury from the proceeds of general taxation. This is not optional; it is mandatory. All the little villages and small cities, in few of which electric lighting is profitable, are to have a new officer saddled upon them, whom every citizen must be taxed to support, whether he will or no, and whether he himself uses electricity or kerosene lamps.

There are 160 villages and cities in Illinois in which electric-lighting plants are operated. In the majority of them but little residence lighting is done, as the profits from such service do not warrant the outlay in copper feeders necessary to do it. Then we here have the statesmanlike proposition to tax all the people of a city in order that a possible fifth of their number may have someone to defend them against the alleged extortion of the lighting company. Taking the average salary of the proposed commissioner at \$1,000 per annum, and adding a gross \$40,000 for assistants' salaries, office rent and other expenses in the 160 municipalities, we have \$200,000 per annum added arbitrarily to the taxes of the people of the state. And absolutely to no good purpose. Such an office would result in benefit to no one except to the faithful politician whom it would support in idleness at the expense of the taxpayer. It would be another fruitful source of corruption in the larger cities, enabling the incumbent regularly to blackmail the corporation holding the franchise. The amounts paid him to obviate the irritation of frequent examinations of books at inopportune and inconvenient times, which the law is framed to allow, would be recouped at the expense of the users of light and power. In the smaller cities and villages, where crookedness is impossible, it would be simply a useless, tax-eating office, for the lighting companies in these small places are now selling their current at prices that barely pay their operating expenses and the percentage of depreciation of their machinery and plant. An officer, therefore, saddled upon small cities for the purpose of compelling such franchise holders to offer reasonable rates would be of value to no one, although increasing the general tax burden in the amount of his salary and office rent and expenses. The utter absurdity of maintaining such an office in small cities will be too obvious to make it worth while for the electric-lighting interests of the state to pay any attention to the bill. Should the country legislators lend themselves to such oppression of their constituents, their seats would be jeoparded.

But deeper than such shallow manifestations of greed and prejudice, aimed at the holders of public franchises, lies a great principle, a principle that, sooner or later, all intelligent persons must recognize. A business is either public or private. If it is public, private interests should not be concerned in it. If it is private, the public has no right to arrogate to itself powers of control. Attempted municipal regulation of a natural monopoly in private hands must result either in injustice and useless irritation to the holders of such privileges or, on the other hand, in debauchery of municipal servants. If the municipality must enter the field of electric lighting in order to insure justice to its citizens, it cannot secure that result by assuming to dictate the policy of a private business. Justice does not spring out of injustice. The municipality may perhaps in justice buy the plant of a private corporation at a price which it would cost to duplicate it, and grant no further privileges; but it cannot, in reason, expect private interests to continue in such business harassed by the unintelligent and often stupid restrictions imposed by ignorant legislators.

Electric Railway for Vicksburg.

It is said that Vicksburg, Miss., with a population of from 15,000 to 20,000, is the largest town in the United States without an electric street railway. But this omission will soon be rectified, for work is in progress on a system 5 1/2 miles in extent for the Vicksburg Railroad, Power and Manufacturing company, the company that operates the electric-light plant. The lines, which are single-track and laid on the principal streets of the city, have been put down by the North American Railway Construction company of Chicago, and the Electrical Installation company of this city has the contract for the overhead construction, and has already begun work.

Municipal Electricians.

The revised constitution and by-laws of the National Association of Municipal Electricians (the new name of the institution organized in Brooklyn, N. Y., September 15, 1896, as the International Association of Fire and Police Telegraph Superintendents) have just come from the press in very convenient pocket form. They should be of interest to every municipal electrician. The new constitution and by-laws were revised and adopted by the executive committee, at Boston, January 28, 1899, in accordance with resolution passed at the third annual convention at Elmira, N. Y., August 9-10, 1899.

Considerable interest is exhibited throughout the United States in this association. The following are the titles of some of the important papers that will be read at the next annual convention at Wilmington, Del., in September:

"The Laws and Government of the Wire Department of Boston," by Commissioner Thomas W. Flood. This is the first time that Commissioner Flood has consented to personally review the very important work carried on by his department, and as Boston is the only city that has such a department, it will no doubt greatly interest and instruct not only the municipal electricians throughout the country, but the electrical public as well.

"Licensing of Employees Engaged in Electrical Work and the Improvement of the Quality of Work and Material," by Captain William Brophy of Boston.

"Advisability of Concentrating the Control of All Municipal Electrical Interests under One Head," by Morris W. Mead of Pittsburgh.

"The Underground System as Applied to the Fire-alarm Telegraph," by S. L. Wheeler, city electrician, Springfield, Mass.

"The Police Signal System of Boston," by John Weigel, superintendent police telegraph, Boston.

"Aerial Construction of Fire and Police Telegraph Lines," by W. H. Thompson, city electrician, Richmond, Va.

"Progress and Development of the Municipal Electrical Interests of Canada," by G. F. MacDonald, Ottawa, Can.

In connection with the next meeting of the association will be held an exhibition of electrical and mechanical apparatus used in various departments of municipal work. A large building, well adapted for this purpose, and ample power will be supplied. The Board of Trade of the City of Wilmington has taken an active interest in this feature of the meeting, and has already appointed a committee to assist in making the exhibition a successful one. The railroads have agreed to make special freight rates to exhibitors.

English Review of American Electrical Progress in South America.

Some time ago the London Board of Trade sent a special commissioner, in the person of Mr. Worthington, to investigate the conditions of British trade in several South American countries. The following extracts from his report cannot fail to interest American electrical manufacturers, for they plainly show that a decidedly favorable impression prevails where American products have been tried.

Mr. Worthington found that the electric-lighting trade of the nitrate works at Iquique, Chile, was leaving English makers, because there is a very capable resident representative of the Westinghouse company in Iquique, who is always ready to negotiate for new installations, to supply small refts for American machinery, and, for a moderate monthly charge, to look after the electric plant continually—an arrangement which suits the companies well.

According to Mr. Worthington the bulk of the electric plant and practically all the electric-traction machinery in Buenos Ayres, Argentine Republic, was made in the United States. "Small electric motors and fittings, too," says the report, "are chiefly American. The American motor is neater, lighter and cheaper. For example, I have seen a three horse power American motor with a hook at the top for carrying it about, which was certainly a neater and less cumbersome machine than an English two horse power motor which was shown me. The English motor is often capable of working far above its indicated power, or, say the power which has been contracted for; but this is not wanted, and only adds to the cost. English makers, too, have given dissatisfaction in their careless packing of delicate machinery, especially voltmeters, which arrive broken, a thing which never happens when they come from the United States."

The hold which American electric machinery has obtained upon the Argentine market is sometimes attributed to its having been introduced in a more energetic and business-like manner, and there may be a good deal in this; but Mr. Worthington is inclined to think, from what he has learned, that its perfection, as a rule, for doing its work, combined with the neatness and lightness of the American machinery, is what has kept it to the front. German machinery—frequently a poor and cheap copy of the American—finds a market, and even Italian work is now being introduced. The American electric machinery is looked upon as the most advanced. The English, Mr. Worthington was told, have not kept pace with the American improvements and inventions, while the Germans have carefully watched and promptly copied the American.

American Institute of Electrical Engineers.

The regular monthly meeting of the Institute, held in New York and Chicago, on the evening of February 15th, a week earlier in the month than usual on account of the regular date falling on a Wednesday's birthday. At the New York meeting Mr. Pierce, Mr. A. Lloyd read a paper entitled "Storage Batteries and Railway Power Stations." It was discussed by Messrs. Hill, Malouin, Bradford, Smith, Hines, Henshaw, Lujar and others.

At the meeting of the executive committee in New York in the afternoon the following associate members were elected: Frank Perry, Adams, Stockton, Cal.; Julia Le Roy Adams, Manchester, Conn.; Paul K. Brown, St. Peterburg, Russia; N. M. Currie, Conneaut, Ohio; John Stungo Codman, Boston, Mass.; Clifford E. Dunn, New York, N. Y.; Chas. William Hutton, Sacramento, Cal.; Edmund Oscar Schweitzer, Chicago, Ill.; Arthur E. Truesdell, Newark, N. J.; Martin B. Waterman, New York, N. Y.; John S. Reece, Jr., Philadelphia, Pa.; Mr. George T. Hancock, consulting electrical engineer, New York, was transferred to full membership.

In Chicago R. H. Pierce presided, and Mr. Lloyd's paper was read by B. J. Arnold. Those who participated in the discussion were Joseph Appleton of Philadelphia, Alex. Dow of Detroit and George W. Knox, Maurice Coster, Mr. Arnold and Mr. Pierce of Chicago. Others present were L. S. Cass of Waterloo, Iowa, and Chas. L. Brown, W. S. Rugg, Geo. M. Mayer, Frank H. Clark, E. H. Clency, Alex. M. Hanbrick, C. Y. Atkins, H. M. Wyckoff, A. C. Libby, George A. Damon, Fitzhugh Taylor, F. S. Willhoit, H. A. Seward, Lucien H. Gilmore, W. D. Ball, James E. George, A. de Khotunsky, C. W. Register and Taylor E. Brown of Chicago.

There was an informal discussion of the advisability of holding further meetings of the Institute in Chicago, and the matter was finally referred to Secretary R. W. Pope and Mr. Pierce, the local honorary secretary, to call western meetings in their discretion.

Trade with Mexico.

Many cities of Mexico are advocating public improvements, such as electric-light plants and electric railways. England, France and Germany are represented on the ground and their manufacturers are vigilant.

American manufacturers enjoy many advantages, however, and as Mexico is so easily reached and has a population as large as that of Canada, New England and all the Rocky Mountain and Pacific states and territories combined, it is well worth attention. The language of the country is Spanish, and circulars in English are so much waste paper. Every route by rail into Mexico has its customs agent, whose business it is to give information as to duties and to facilitate the passing of goods through the Mexican custom house. They are men of exceptional intelligence and experience, whom it is well for manufacturers to consult. Long credits are the rule in Mexico, and with established houses are entirely safe. A mercantile agency under American auspices is in working order in Nuevo Laredo, and is performing those functions so necessary to the safeguarding of trade.

Proposed License Fees in Washington.

A bill is pending in Congress to regulate licenses in the District of Columbia. One of its provisions is to the effect that proprietors of electric-light plants shall pay five cents on every hundred dollars of capital stock. The provision is made, however, that the tax required for a license shall not be construed as exempting any company, association or person engaged in the distribution of electric light to patrons from such general or personal taxes as may be assessed upon its capital stock, gross receipts or other property under existing laws.

The bill also provides for a tax on automobiles used for the transportation of passengers or merchandise for hire, profit or gain. Proprietors of all vehicles not running upon railway tracks, and using electricity or other approved agency as a motive power, shall pay \$12 per annum for each vehicle with a capacity not to exceed to passengers, and \$15 each per annum for vehicles with a capacity exceeding 10 passengers. Automobiles for conveying merchandise are to be taxed \$10 each per annum.

Electrical Machinery Exports.

The Washington correspondent of the WESTERN ELECTRICIAN writes as follows: "It is gratifying to observe that American electrical manufacturers have learned the significance of our industrial supremacy, and it may be assumed that the conditions of foreign trade are now being studied by every manufacturer who is confronted by the problem of finding outlets for his productions. This fact is shown by official statistics, which show that the value of our export trade in electrical machinery in 1897 were valued at \$9,745,371, while in 1898 they passed the export reached the value of \$22,644,644, a net gain of \$12,900,000 in a single year. To be noted, too, that the value of electrical machinery and 'other electrical equipment' in the general classification in the general trade reports...

DEVELOPMENT OF THE TELEPHONE FIELD.

Illinois Telephone and Telegraph Company.

The twice-amended ordinance of the Illinois Telephone and Telegraph company, which purposes to furnish telephone service in the city of Chicago, in competition with the Chicago Telephone company, was passed by the City Council on Monday night. The ordinance now complies with all of Mayor Harrison's objections and will undoubtedly be signed by the executive. The new company is given the right to construct and operate a telephone system in the city of Chicago. The last amendment provides that there shall be nothing in the grant to interfere with the full and free exercise of the city's power to regulate telephone prices or license companies.

For the first time officially the list of backers of the new company was presented through a communication to the mayor from Charles H. Aldrich, the company's counsel. The promoters, said to represent \$100,000,000 of capital, were named as follows: Adolphus Busch, William J. Lemp, Hopkins J. Hanford, C. Marquard Forster, Philip Stock, Lawrence B. Pierce, Henry Nickolaus, George J. Kobusch, William F. Nolker, William D. Orthwein, Breckenridge Jones, Charles H. Turner, C. K. D. Walsh, Rolla Wells, William F. Haarstick, Otto U. von Schrader, Ellis Wainwright, August Gehner, Samuel M. Kennard and Julius S. Walsh, St. Louis; E. A. Everett and associates, Cleveland; S. P. Sheerin, Samuel S. Morss, Indianapolis; Milo G. Kellogg, Chicago.

Mr. Aldrich is also credited with the statement that other Chicago capitalists and large employers of labor, whose names he had not yet received written permission to disclose, were interested in the new company. He stated that some of these capitalists probably would not disclose their attitude until the exchange was well under way, and perhaps not until it was completed.

The ordinance as amended provides for a franchise for 30 years, covering all the territory inside the limits of the city of Chicago.

The compensation to be paid the city is nothing for the first 10 years, three per cent. of the gross receipts for the second 10 years, five per cent. for the next five years, and seven per cent. for the remaining five years.

In the territory bounded by Fullerton avenue, Western avenue, Twenty-second street, Halsted street, Fifty-fifth street and the lake, all wires are to go underground.

In all conduits one duct shall be given to the city, and the city can use all the company's poles.

If the company does not have an exchange with 2,000 subscribers in operation within five years the franchise is forfeited.

The cost of telephones shall not be more than \$85 a year for business instruments, \$50 for residences, and \$25 for public telephones.

The city is given a number of telephones free, and can rent instruments for fire and police use for five dollars a year.

An option is given the city to purchase the plant at the expiration of the franchise.

Cheap Telephone Rates Abroad.

[From the Washington Star.]

There are two Swedish telephone companies—the Government Telephone company and the General Telephone company (formerly the Bell Telephone company). The former charges per year 80 crowns, or \$22, in every city, and 90 crowns, or \$25, in the country. The latter company charges 60 crowns, or \$16, per year in the cities, towns and villages, except in Stockholm, where you pay only 30 crowns, or \$9.75, per year. By paying these charges you are entitled to have your telephones repaired, whenever needed, besides having them inspected twice a month.

In the city of Stockholm alone, with a population of 230,000, there are no less than 36,000 telephones. Outside the city limits, in any town, you pay for telephoning a distance of 30 English miles 15 up to 30 ore, or four to eight cents, for three minutes' conversation. The telephone system has been extended to the northernmost town in this country, Haparanda. From this place to Stockholm, a distance of 720 English miles, you can communicate by telephone for just 27 cents.

There is hardly a village in the whole country where there is not a dozen telephones are not found, and in the woods you may, during your travels, find a telephone put up for the accommodation of the hunter, trapper, or tourist. In these wild and deserted places there are no people living for miles around, and he that might be able to communicate with friends far away. He is expected to pay the charges, and he will find in the guide books hanging up at the telephone.

Well-grounded Fears.

[From the Washington Star.]

The proposed construction of a 2,000 independent telephone lines in the State of Iowa, 100 of which are to be in the city of Des Moines, is said to have become a source of concern to the Bell telephone people.

Telephone News from the Northwest.

[From the Minneapolis correspondent of the WESTERN ELECTRICIAN.]

The Central Wisconsin Telephone company held its annual meeting at Black River Falls, Wis., and voted to put in a new switchboard there. The present board has 50 drops, but the new one will either have 100 or 200 drops.

The Huefner Telephone company has extended its wires to Mondovi, Wis., and installed an exchange with 30 instruments.

The new telephone company at Janesville, Wis., charges the old company with stringing dummy wires to lamper the new company. The old company denies this, but says all the new wires will soon be in use, and also charges that the new company is neglecting the rule which requires its lines to be three feet over the Wisconsin Telephone company's wires.

The report of the Wausau (Wis.) Telephone company reveals an increase of over \$7,000 in the value of the plant in three years and four months and the payment of 46 per cent. dividends. The local paper declares the service excels that of the Wisconsin Telephone company prior to the time it had competition.

John Gallagher, a lineman in the employ of the Northwestern Telephone Exchange company, fell from a ladder in St. Paul and sustained concussion of the brain.

It is reported the local telephone company at Oelwein, Ia., contemplates building a line to West Union, Ia., by way of Scott, Maynard and Fayette.

The Duluth Telephone company of Duluth, Minn., has announced a reduction in rates on party-line service for business and residence use. The company also contemplates putting in sub-exchanges at Lakeside and possibly at other points.

The mayor of Duluth, Minn., wants a bill passed to levy a tax for five years for the purpose of constructing and operating a telephone plant for the city.

The telephone company at Reinbeck, Ia., seeks to shame the telephone-borrowing fiend by publishing a card to the public stating that if one must borrow from a neighbor the least to do is to help him pay for the instrument.

The Northwestern Telephone Exchange company is securing a right-of-way into Fertile, Minn.

The Michigan Telephone company announces at Marquette, Mich., that the upper peninsula is to have a much improved service, including copper metallic circuits, long-distance connection with Detroit, Chicago and the West.

R. H. Evans of Detroit, Mich., is an applicant for a telephone franchise at West Superior, Wis. He is also an applicant at Duluth, Minn., and offers to make as good terms with one city as with the other.

The Northwestern Telephone Exchange company has consolidated the local exchange at Spring Valley, Minn., with the long-distance office.

The central office of the Martin Telephone company at Williams, Ia., was burned, which rather crippled the service and entailed considerable loss.

The Pipestone (Minn.) Telephone company will shortly move to new quarters with its central office. A new switchboard will be put in and other changes made.

There is talk of a telephone exchange at Belmond, Ia.

The telephone company has decided to put in a cable at Morris, Minn., over the tracks where the wires recently broke from the weight of ice and sleet.

Rowe Brothers of Pierre, S. D., propose to construct a telephone line from Sioux City, Ia., to the Black Hills of South Dakota, via Ponca, Newcastle, Niobrara and Valentine, Neb.

The Fergus Telephone company will extend its toll system from Battle Lake, Minn., to Amor, Phelps and Maine, Minn., in the spring.

The Minnesota Senate has passed a bill permitting telephone companies to take advantage of rights-of-way controlled by railroads, by resorting to condemnation proceedings.

The Mississippi Valley Telephone Exchange company now announces that its exchange in Minneapolis will be in operation by July 1st. The company claims 3,500 subscribers in Minneapolis and 2,000 in St. Paul.

The Home Telephone exchange at Sioux City, Ia., was damaged by crossed wires with the electric-light system recently.

The Tri-city Telephone company has placed a new switchboard in its Lyons, Ia., office.

The telephone toll line has been completed between Grand Forks, N. D., and Inkster, Orr and McCanna, N. D.

Charles E. Wisard will soon install an exchange at Howard, S. D.

The Village Board of Wittenberg, Wis., has granted telephone franchises to the Little Wolf River Telephone company and to the Northeastern Wisconsin Telephone company. A local exchange will be put in.

The Central Telegraph and Telephone company of Stevens Point, Wis., has been incorporated, with \$100,000 capital stock.

Robinson & Wilson of Washington, Ia., will build a telephone line to Wellman, Ia., in the spring.

Paul N. Krauer, formerly with the Bell com-

pany of Chicago, has signed a contract to take the management of the Mutual Telephone company's business in Des Moines, Ia.

Arrangements have been completed by which the Ralston telephone interests centering at Marysville, Mo., and the Mount Ayr and Clearfield Telephone company will connect with the Mutual Telephone company of Des Moines. The system will then connect Des Moines with Kansas City, St. Joseph, Marysville, Savannah and all the larger towns in Northwestern Missouri, with Omaha, Council Bluffs, Nebraska City, Plattsmouth and other towns in Southwestern Iowa and Eastern Nebraska.

The Cedar Valley Telephone company will probably build a toll line between Hampton, Ia., and Dumont.

The La Crosse Telephone company is putting in a new switchboard at Onalaska, Wis.

A telephone line has been completed between Monticello, Ia., and Scotch Grove.

Farmers of Northern Iowa in several districts are fixing up telephone connection with their neighbors by means of their barb-wire fences.

John W. Kelly, the alleged absconder from the Iowa Telephone company's Waterloo office, has been arrested and brought back for trial.

The Iowa Telephone company will establish an exchange at Humboldt, Ia., in the spring.

The new telephone company has 360 instruments in use in Eau Claire, Wis., 200 in Chippewa Falls and about the same number in Menomonie, Wis.

Cold weather and high winds have been destructive to telephone toll lines near Colville, Wash. Connection with both Spokane and Republic was discontinued.

The Cedar Valley Telephone company has added 60 subscribers to its system in Cedar Falls, Ia., since last July, and now has 250.

Telephones of the World.

The government of Sweden has collected statistics upon the development of the telephone industry in all parts of the world, and the result of this investigation is presented in tabulated form by Edward D. Winslow, consul-general at Stockholm, in a report to the United States government at Washington. Mr. Winslow furnishes no particulars as to the manner of obtaining the information or the sources depended upon. Following is the table presented, which, although incomplete, is nevertheless interesting:

Countries.	Instruments in use.		Distance covered.	
	Number.	Kilom.	Miles.	
Sweden (1897).....	56,500	120,000	74,568	
Norway (1897).....	20,678	53,889	33,481	
Denmark (1895).....	10,500	15,000	9,321	
Finland (1895).....	7,351	21,000	13,049	
Great Britain and Ireland (1894).....	69,615	134,215	83,461	
Holland.....	8,000	8,000	4,971	
Belgium (1895).....	9,227	26,127	16,235	
Germany (1896).....	151,101	236,712	147,093	
Austria (1896).....	21,616	74,630	46,375	
Hungary (1896).....	10,293	28,870	17,940	
Switzerland (1897).....	28,846	76,593	47,594	
France (1894).....	27,736	101,754	63,250	
Italy (1896).....	11,951	21,000	13,049	
Spain.....	11,038	22,984	14,282	
Russia.....	18,495	65,000	40,391	
Roumania.....	750	227	141	
Bulgaria (1893).....	300	600	372	
Japan (1897).....	3,232	8,468	5,262	
British India.....	1,601	3,695	2,296	
French India.....	89	556	345	
Philippines.....	452	951	592	
Algiers.....	235	391	224	
Tunis.....	200	452	281	
Senegal.....	50	87	54	
The Cape and Natal.....	600	1,770	1,100	
United States (1896).....	772,627	1,296,655	805,711	
Cuba.....	1,818	1,900	1,181	
Canada (1898).....	33,500	70,840	44,020	
Mexico (1896).....	9,000	10,000	11,807	
Paraguay (1896).....	500	1,000	625	
Uruguay (1896).....	3,209	13,063	8,117	
Australia.....	855	3,846	2,390	
Total.....	1,288,163	2,429,254	1,509,499	

Some of the reports have no commercial value at the present time. Great Britain and Ireland, for instance, have made considerable advancement since 1894, when the data here presented were obtained. In June, 1898, the National Telephone company had 820 exchanges open, and 112,769 instruments in operation, which will indicate the rate of advancement in England. The statistics from France are equally valueless for present use, and the returns from the United States do not include the period of greatest activity in this country. However, the attempt of the government of Sweden to collect statistics of this character should be encouraged and the co-operation of other countries should be given.

EXTENSIONS AND IMPROVEMENTS.

The Oregon Telephone and Telegraph company has had a representative at Cottage Grove, Ore., working up a local system. Sixteen telephones have been subscribed for and the extension is now assured.

The act of Congress authorizing the Missouri and Kansas Telephone company to construct and maintain lines and offices for general business purposes in the Ponca, Otoe and Missoula reservations, all in the territory of Oklahoma, has been approved, and work on the extension is expected to be commenced at an early date.

Telephone Privileges in China.

[From the London *Statist.*]

Shanghai, as our readers are aware, is a town founded as a consequence of our wars with China. There is a British settlement and a French settlement, the British settlement being far the larger and containing considerable numbers of Americans and Europeans of all nationalities. The French settlement is almost exclusively French. Each settlement is administered by a municipality, and it is the action of the British municipality—which the French in this case follows blindly—in regard to the telephone company working in Shanghai which we would bring to the notice of our readers and commend to the consideration of Lord Salisbury. The fortunes of the China and Japan Telephone company have very little interest for the public, and we certainly should not intrude their affairs upon our readers were it not that the attitude assumed by the municipality is an object lesson which, we venture to think, supplies a useful comment upon Lord Salisbury's policy in China. The telephone company has been working since 1883 or 1884 without any privilege of any kind, or, according to the municipality, any agreement even with the municipal authority. And it has gradually built up a business, which, to put it briefly and clearly, the municipality now proposes to set up to auction, inviting capitalists all over the United States, all over the continent, and here at home, to bid eagerly for. The municipality has issued a little pamphlet, inviting tenders for the working of the telephone system in Shanghai, with an offer of a concession for 30 years, the municipality, however, to have the right of purchase at the end of 15 years. The pamphlet tells us that at the time it was made up the company had 338 subscribers, and that these subscribers and such others as may be added before the concession is granted will be handed over to whomsoever is successful. Of course, we are aware that the municipality cannot compel these subscribers to join a new system. What the municipality means, no doubt, is to hold out an inducement to capitalists in Europe and America by telling them that there are already 338 subscribers to the existing company, and that no doubt these find the telephone of so much use that they will continue their subscriptions whoever may supply the service. Is not this a very plain expression of opinion that British enterprise in China needs neither encouragement nor protection; that British traders are very well able to take care of themselves; and that any of them who are fools enough not to take security for the safe enjoyment of whatever enterprise they may build up deserve to suffer? And remember, that the expression of opinion is from the trading community of Shanghai. Again, it will be noted that the trading community of Shanghai invites Americans and the people of the continent, without exception, to send in tenders. . . . It would be wearisome and serve no useful purpose to go into the various conditions imposed upon those who tender. But there is one point which throws so much light upon the allegation that encouragement and protection are required by merchants in China that we cannot refrain from noticing it. Those who send in tenders are obliged to state the charges they intend to make to subscribers. But the municipality reserves to itself the right to revise the terms if those who carry on the telephone business extend that business anywhere in China beyond the British and French settlements. It is hardly credible that any capitalist in his senses will agree to this. And, therefore, we do not expect that very many will tender. But, as defining the very little importance attached by the British residents in Shanghai to either encouragement or protection, the proposal is exceedingly instructive. The tenderer must first state what he intends to charge. And the charge, one would suppose, is the main point in the business, for nobody will carry on the telephone system except for the purpose of making a profit. Yet, the tenderer, having stated what he requires, is told in the same breath that if he extends his business the municipality may change the terms altogether. Now, it is obvious that if China is about to be opened up and to advance economically, it may be of the very greatest importance to those who in future will carry on the telephone business in Shanghai to establish themselves in other great centers. But if they do so the threat is held over their heads that the municipality of Shanghai reserves to itself the right to alter the terms of the contract. Whether this is law we do not pretend to say. But, at all events, it is a very eloquent comment upon the alleged necessity that is felt for encouragement and protection.

MANUFACTURERS AND DEALERS.

The Eureka Electric company of Chicago has met with success with its telephone apparatus, and is securing nice contracts daily. The principal feature of its telephones is the amplifying, long-distance transmitter, which is guaranteed to ring indefinitely, and which, for articulation and quality of tone, is said not to be equaled by any in the market. The receivers are double-pole, and the work is of the highest finish. The new No. 44 transmitter is adapted for replacing upon instruments, either upon the magneto or upon the transmitter boxes, and is guaranteed to give entire satisfaction. The company is located at 157 and 159 South Canal street.

The street-railway company of Des Moines, Ia., will test the various kinds of fenders.

Bell Companies' Mortgages.

An Indianapolis dispatch of February 17th says: The Central Union Telephone company to-day filed with the recorder of Marion County and the recorders of 69 other counties of the state where the company has property a mortgage for \$4,000,000, given to the Old Colony Trust company of Boston to guarantee the issue of \$6,000,000 five per cent. gold bonds, payable January 2, 1919. The money derived from the bonds will be used in the extension and improvement of the company's lines. The document bears \$3,000 worth of revenue stamps, and the total cost of recording the mortgage in Indiana is more than \$5,000. The recorders of the 69 counties besides Marion were assembled in this city to receive the mortgage.

Poor & Greenough, bankers of New York, advertise for sale \$2,500,000 of consolidated-mortgage five per cent. bonds of the Michigan Telephone company of Detroit. They state that the capital of the company is \$2,500,000, and that the total bonded indebtedness, including the new issue, is \$2,785,000. The number of subscribers is placed at 19,052, and the structural value of the property on December 31, 1896, is stated to have been \$2,127,001.81, with \$809,870.63 expended since. The letter of President C. J. Glidden of the company to the bankers is of some interest. It is as follows:

The board of directors and executive committee of the Michigan Telephone company have authorized the proceeds of the sale to you of \$2,500,000 consolidated-mortgage bonds to be applied as follows:

- First—To purchase and cancel the \$650,000 outstanding first-mortgage bonds of the company. Contract has been entered into with the holders of these bonds for the purchase of \$365,000, leaving outstanding bonds to the par value of \$285,000.
- Second—To purchase land and erect exchange buildings for the exclusive use of the company at the following places: In Detroit, for branch exchange buildings, five. For main exchange buildings, one each at Battle Creek, Bay City, Kalamazoo, Lansing, Marquette and Port Huron. The company already owns land and buildings to the value of \$264,552.84, consisting of main building and one branch at Detroit, and main exchange buildings at Jackson, Saginaw and Grand Rapids.
- Third—To extend the long-distance service to all important sections of the state not already covered, including the iron and copper district of the upper peninsula, thereby connecting this district with all long-distance points of the state and the entire long-distance service of the United States and Canada.
- Fourth—To place extra copper metallic circuits for long distance service on pole routes already established throughout the state, providing for a large and increasing business.
- Fifth—To pay the cost of connecting new subscribers at all exchanges, and general additions to the company's extensive plant. Our past experience has proven that extensions and improvements of the character outlined have largely increased the revenue of the telephone companies, thereby providing for all fixed charges and regular dividends upon the capital stock.

Telephone Girls Housed in Hotels.

As the result of the recent storm, the New York Telephone company was, on February 13th, deprived of the services of nearly half of its operators, the latter being snowbound at their homes. It happened to be a holiday, and the service was not materially crippled. To avoid a recurrence of this emergency, over 200 of the girls were lodged in downtown hotels the next night, as the storm still continued.

A telephone message was sent to the Astor House in the afternoon asking if 100 rooms could be engaged for the use of the girls in the Franklin street and Cortlandt street exchanges. The Astor House was already crowded, and the reply made was that only 21 girls could be accommodated. Four rooms, with two double beds in each, accommodated 16 girls, and five others were put in another room.

The Cosmopolitan Hotel at Chambers street and West Broadway took care of 160 more of the operators. At the Broadway Central Hotel 24 girls from the Spring street exchange stopped for the night. A crowd of girls from the Eighteenth street plant went to the Continental Hotel, Twentieth street and Broadway, while 32 girls from the Thirty-eighth street exchange went to the Hotel Normandie.

In each case the hotels served dinners and breakfasts to the girls at the telephone company's expense. The order for the girls to go to the hotels was not compulsory, but they gladly accepted the offer rather than make the trip to their homes through the storm.

Motor Plant for Wholesale Grocery.

Reid, Murdoch & Co. will occupy the new Garrett building at Lake and Market streets, Chicago, and will install probably the largest electric-power plant possessed by any grocery house in the country. The building is equipped with its own generating plant, which will supply current to over 40 motors used in different parts of the large establishment to drive spice mills, coffee roasters, fans, elevators, etc. The motors will be both direct-connected and belted to shafting. Thirty-nine of the motors, ranging from two to 25 horse power each, were sold by Kohler Bros., and are of a special slow-speed type made by the Northern Electrical Manufacturing company.

The East Jersey Electric company was incorporated in New Jersey last week, with an authorized capital of \$1,000,000. The company is empowered to manufacture and deal in electricity, light, heat and power of all kinds, including compressed air. The incorporators are Charles F. Johnson of New York, S. Hand Taylor of Philadelphia and Joseph P. Cooper of Rutherford, N. J.

Electricity on Board Ship.

[Continued from page 10.]

been able to learn from the electrical engineers in charge, all the electrical apparatus on board, and stated the supreme test of the success of the project. The officers of the Brooklyn are confident that the performance of the electrical machinery will be satisfactory. They report that with respect to the efficiency of the machinery and fineness of control there is no room for improvement, rather a compliment. The chief project is the complete authority, for the officer in command, to have the actual command of the current in the event of an emergency. This is not only unprejudiced and impartial, but final and conclusive.

It is hardly necessary to say that electrical machinery to be reliable must have reasonable care and attention from men who know something about it. This is true of any machinery, and it is a bad policy, as well as untrue, to say, as is sometimes said by those who should know better, that an electric motor requires no attention. Cleanliness is very necessary, and may be considered as a first essential of successful operation. It is astonishing to see how little has to be done to an electric motor if it is kept scrupulously clean; but this cleaning must be regular and intelligent. From what has been said, it may safely be affirmed that electric machinery can be made a reliable on shipboard as any other machinery, and with this in mind we can turn to the question of efficiency, including weight of plant and first cost.

There has been very little data published on the performance of ship auxiliaries, but a valuable contribution to the subject appeared in the February (1898) number of the *Journal of the American Society of Naval Engineers*, by Passed Assistant Engineer W. W. White, United States Navy, entitled "Steam Consumption of the Main and Auxiliary Machinery of the U. S. S. Minneapolis." This vessel, as is generally known, is a first-class protected cruiser of about 7,500 tons displacement, with three screws (each operated by its own engine) and a trial speed of over 22 knots per hour. She represents the highest type of her class, and is in every way a credit to her designers and builders. She has between 30 and 40 steam auxiliaries and more than 150 separate steam cylinders. Her only electric auxiliaries are the lighting generators and a few small ventilating sets and ammunition hoists. In order to ascertain the steam consumption of her main engines and auxiliaries, Mr. White, who was serving on board the Minneapolis at the time as one of her engineers, made a series of careful observations during a run of the vessel of seven days from Gibraltar to League Island, Philadelphia. Indicator cards were taken on all auxiliaries fitted for the purpose (31 in number), and the losses from leakage, condensation and radiation were carefully estimated and the water evaporated carefully measured. The results obtained were certainly startling.

The average weight of steam used by the main engines per hour was 33,620.6 pounds, and by the auxiliaries 10,146.7 pounds. That is, the auxiliaries consumed nearly 25 per cent. of the total coal used. The main engines consumed an average of 20.83 pounds of steam per indicated horse power per hour, and the auxiliaries an average of 119 pounds per indicated horse power per hour (the lowest being 55.06 pounds and the highest 318.68 pounds per indicated horse power per hour). The steam consumption of the same or similar auxiliaries varied greatly, due, doubtless, to the varying conditions of packing rings, bearings and valves, and of the load. These results are not exceptional. In fact they are probably better than the average obtained on most warships or merchant vessels. The new British cruiser Powerful (14,000 tons displacement) is reported to have used 8,300 tons of coal from England to Hong Kong of which 3,400 tons (or over 40 per cent.) was required for the auxiliaries.

Under the most favorable conditions the auxiliaries of a large ship probably consume at least 20 per cent. of the total coal and water used. This is more than twice as great as the consumption in a modern central station, and there is no good reason why as good results should not be obtained at sea as ashore.

Let us assume a required central-station capacity for a first-class battleship of 1,000 horse power effective at the motors. The present standard electric motive force for naval installations is 80 volts, and for the merchant marine about 100 volts. This low voltage was originally adopted on war ships in view of the searchlights, which require 50 volts only, and it was desired to introduce as little back resistance as possible. At this time 100 volts were, of course, in use, and the electric plant was used for lighting exclusively. Such a voltage is, however, entirely unsuited for a 1,000 horse power plant, the weight of the distribution system would be very excessive, but the size and weight of the generator would be prohibitive. The three-wire system of 220 to 250 volt two-wire system should be adopted, using the necessary resistance in the distribution circuits when they are in service, sure they consume a relatively small percentage of the total energy, and are not regularly in use, this can be done without undue sacrifice.

The generating plant should consist of two units of the same size, each unit consisting of a compound engine driving a pair of generators, one a single generator, depending upon whether the two-wire or two-wire system is used. Assuming an efficiency of

82 per cent. for engine and generator and an average line and motor efficiency of 80 per cent., the total efficiency of the system (between the indicated horse power of the generating engines and the effective horse power of motors) is 65.6 per cent. In other words, to develop 1,000 horse power at the motors will require 1,500 indicated horse power at the engines or about 900 kilowatts generator capacity. Six sets of 150 kilowatts each, with one in reserve, would be required. A good compound engine working at approximately full load (and with six units, those in actual service can always be operated at or near full load) will require 20 pounds of steam per indicated horse power per hour. Assuming a total efficiency of the system of 65.6 per cent., as above, it will require about 30 pounds of steam per effective horse power per hour at the motors. If we allow 25 per cent. margin for losses due to steam leakage, condensation, mechanical friction of gears, etc., we still have an economy of 37.5 pounds per horse power per hour, as against 119 pounds as shown by the Minneapolis test. In this case the auxiliaries tested aggregated 471 horse power developed, using 56,049 pounds of water per hour. At eight pounds of water evaporated per pound of coal, the coal consumption was 7,000 pounds per hour, or 84 tons per day, assuming that this power was required for 24 hours. If the water consumption had been at the rate of 37.5 pounds per indicated horse power per hour instead of 119 pounds, the coal used per day for these auxiliaries would have been 26.5 tons, a saving of 57.5 tons, or nearly 70 per cent.

It is fair to assume that by the introduction of compound engine and improved mechanical appliances on some of the auxiliaries, the average steam consumption can perhaps be reduced to 75 pounds per horse power per hour, but this is still 100 per cent. in excess of that required for the electric drive. Assuming an average daily use of 800 horse power effective at the auxiliaries on a first-class battleship at sea, this difference in efficiency means a saving in water used of 360 tons per day, and in coal a saving of 45 tons per day. All steam cylinders connect with the condensers, so that the water used by the auxiliaries is not lost but is used over and over again, it being necessary to supply only that lost by leakage in the pipes and condensers. The extra pumping duty is large, however. The coal saved, on the other hand, means that with a given coal endurance (or "steaming radius") a vessel can carry from 10 to 20 per cent. less coal, or, expressed in another way, with the same coal capacity, she will have from 10 to 20 per cent. greater steaming radius. The average price paid in the navy for coal (including stations in all parts of the world) is probably at least \$7 per ton. There is, therefore, in the case assumed a direct saving in running expense of \$315 per day for coal alone. It may be argued that a vessel in port does not use her auxiliaries to the same extent that she does at sea, and that, therefore, the comparisons made are misleading. This may be true as to actual savings in pounds of coal and water or in dollars and cents, but the percentage differences hold true in any case. Furthermore, a ship is built to keep the sea, and her efficiency and usefulness are measured by her performance at sea and not when incidentally or accidentally in port. Her weights are distributed and apportioned, and her power, speed and "steaming radius" are designed for sea conditions, and it is these conditions alone which should be considered.

The weight and space required for plant are important matters, for a modern steamship, and particularly a war vessel, has every available inch of space and pound of weight carefully allotted; and it is sometimes difficult for the designers to adjust the conflicting elements (which may be equally important) so as to provide for all and still keep within the prescribed limits. The present weight of steam auxiliaries of a first-class battleship, assuming a total capacity at full load of 2,000 horse power, as before, is about 200,000 pounds or 100 tons. If the electric drive is used we must add the weight of the generating plant. The navy specifications limit this weight at present to one-third of a pound per watt of rated capacity. With 1,050 kilowatts capacity (six units of 150 kilowatts for service and one for spare) the weight would be 350,000 pounds or 175 tons. The electric auxiliaries would weigh about the same as steam, or 100 tons, a total of 275 tons, as against 100 tons for steam drive. There would be some saving in the wiring, as against steam and exhaust pipes, so that it may be assumed that the electric plant, with the generating sets described, will weigh between two and one-half and three times the steam drive. As an offset, however, we have the saving of 10 to 20 per cent. in coal required for a given steaming radius, which in a ship of this class would amount to between 200 and 400 tons. Furthermore, in the future a satisfactory steam turbine comparable in economy with the compound engine is developed for marine work, as now seems probable, the weight of the generating plant will be reduced to 50 per cent., and then the electric drive will prove favorably in the respect with steam, and there will still be the saving in weight of coal required for a given endurance.

The space necessary for plant must be considered as one of the vital parts of the ship, and as such it should be located below the protective deck. At first it may be said that it will be difficult to find space for such a large plant, but it must be remembered that the space required for 200 to 400 tons of coal is available in addition to the space at present allotted

for dynamo room, and these combined will certainly be more than sufficient.

The application of the electric drive to the various ship auxiliaries must be carefully studied in each case. The problems involved, however, are not more difficult than many special applications on shore, nor is there anything about them which a competent electrical engineer, with a proper knowledge of sea conditions, is unable to solve. The first cost will undoubtedly be greater than with the steam drive, but the savings in "operating expense," if capitalized, will much more than offset this difference in first cost.

The problem is purely an engineering one, and should be approached in a business-like way. Will the electric drive be equally safe, simple and reliable, and will it be more efficient than the present system of steam drive? This is the question in a nutshell, and I believe that the figures and data which I have presented enable us to answer it most emphatically in the affirmative. Other nations, particularly England, Germany and France, have already introduced the electric drive extensively on their ships, both in the navy and in the merchant marine; and it is earnestly to be hoped that our own navy, with its magnificent ships, officers and men, of whose record we are justly proud, will not lag behind in this important respect. Once provided the proper tools, and there need be no fear in this country that the necessary men to handle them properly will not be found.

I have not touched upon some of the minor electrical applications which have been made aboard ship, such as searchlights, range finders, engine-room telegraphs, speed and helm indicators, signal sets, telephones, etc., etc. Some of them, such as the signal sets and searchlights, are of considerable importance both from the military standpoint and for navigation purposes, and have stood the test of service admirably. Others, like the range finder and telephones, while of great utility, have not yet demonstrated that they can be relied upon at all times; while others still may be considered as luxuries (sometimes of doubtful utility) rather than necessities. All of them come within the province of the electrical specialist, rather than the electrical engineer, and have no direct bearing on the main problem discussed in this paper.

Some General Observations on Electric Traction.¹

By HORACE F. PARSHALL.

A general paper on electric traction must be to some extent discursive, and, from the standpoint of those looking for specific facts, superficial.

It is a natural thing for engineers to reason from experience with electric-lighting plant, as to how best to design plants suitable for electric-traction purposes. Such reasoning, however, is likely to be defective and lead to wrong results. A primary difference between electric lighting and electric traction, so far as the station is concerned, relates to the difference in the nature of the load—one being approximately constant from moment to moment, and the other varying between wide limits, and at such a rate that many engineers liken the strains upon traction apparatus to those upon rolling-mill engines. Another difference of great importance is that in a plant of given nominal horse power from three to five times the quantity of electricity would be generated for traction as for lighting purposes; consequently, a greater capital investment, greater refinement in the machinery and greater margins in the individual machines, or in the number of spare machines, are commercially permissible in the case of electric traction. In general, lighting machinery is called upon to work at full load for a few hours in the day, whereas traction machinery is generally called upon to work at approximately full load for many hours in the day.

The steam-generating plant for either lighting or traction of the same capacity need not differ in character to be equally efficient. Having reference, however, to the better load factor of the traction plant, and consequently a greater consumption of coal and a lesser ratio of cost of labor to that of material, better arrangements as to coal-handling machinery and coal storage are justified. More elaborate arrangements of steam-piping are also justified, since the loss, due to condensation in steam pipes, is determined by the number of hours the pipes are under pressure rather than by the quantity of steam carried by them.

Steam engines have been the subject of frequent discussions. It has been a much-debated point as to whether or not an engine should have a heavy fly-wheel. This question resolves itself into the most economical way, average loads considered, of getting the maximum effort from the steam engine to take care of the temporary overloading incident to traction work.

The dimensions of the cylinders of engines for good economy are determined with reference to average loads. For best economy, then, at good regulation, heavy fly-wheels are necessary to assist in overloads in traction work. The question of governing has also been frequently discussed. I do not understand why this question should be discussed, since nobody is of the opinion that an engine that governs closely is at a disadvantage. Such

¹ Read before the Northern Society of Electrical Engineers (English), January 21, 1899.

engines do not cost appreciably more, and are now generally manufactured. In reading such discussions, I have frequently wondered why the electrical conditions met with in parallel running have not been taken into consideration. The necessity of close regulation of steam engines was first demonstrated in the case of generators running in parallel, where the load did not properly divide with rapidly varying loads unless the engines governed with fair accuracy.

Another matter frequently discussed is that in respect to the speed of engines. Here, also, the electrician is entitled to some voice, since experience has clearly demonstrated that each size of dynamo has a range of speed through which its performance, either as to efficiency, regulation or sparking, is best, and dynamos built outside of this range of speed are made at the expense of efficiency, regulation or commutation.

The speed of the 1,500 kilowatts dynamos which I designed some years ago was limited to 75 revolutions per minute. Experience since then has not demonstrated the advisability of increasing the speed beyond this for this size of machine. My own experience justifies the statement that the mechanical and electrical conditions in the case of the larger direct-connected generators generally coincide in the matter of speed.

The system of transmitting mains for distribution, on account of the better load factor in traction installations, should be designed, for most economical working, with a greater cross-section than in the case of lighting with its smaller load factor. This is obvious from Lord Kelvin's law, in which the interest that goes on perpetually is balanced against the cost of the energy wasted in the mains. Clearly then, as the cost of energy does not vary in the simple ratio of load factor if mains are to be utilized three or four times as many hours in the year at rated capacity in one case as in another, a large cross-section cable is required if the cost of the wasted energy is to balance the interest account.

Apart from the proper designing of a given system of transmission and distribution, there remains the broad question as to what will be the nature of the transmission; that is, whether continuous currents shall be used or whether the distribution shall be multiphase, with sub-stations. The solution is to be determined in respect to the amount of power and the distance to which it is to be transmitted, and in particular cases to the conditions of distribution. Thus, where a very small voltage drop is permissible in the consumer's circuits, as in the case of earth returns, multiphase transmission with frequent sub-stations becomes a necessity, where under less restricted conditions continuous-current transmission would be more economical.

For comparison between continuous-current high-tension transmission and multiphase transmission, see *Proceedings Institution Civil Engineers*, Vol. cxxxiii., Paper No. 3,090.

It appears from this that the distance at which multiphase currents become efficient, as compared with continuous currents at 500 volts, is somewhat less than has been frequently anticipated.

The fixed losses in a multiphase system for the distribution of power for traction work are determined largely by the maximum momentary load which may come upon the sub-stations. When the ratio of the average to the maximum temporary load is comparatively large, the distance at which continuous currents become more efficient than multiphase currents is increased. In very large traction installations, in which the ratio of the average to the maximum approaches unity for average working, the distance at which high-tension currents are more advantageous is lessened. What method of transmission will be most efficient in a particular case cannot be determined without knowledge as to the nature of the load. In the Dublin installation, which I have recently designed for 250 cars, the power station is approximately in the center of the system. The average distance of transmission is about 2½ miles. I have used 500 volts continuous current with so-called "boosting machines," taking the current out of the rails at certain points so as to restrict the maximum drop in the earth to two or three volts. For two lines, extending some eight miles from the power station, I have, at a distance of about six miles, planned to install a rotary-converter station. The multiphase load, however, being such a small fraction of the whole, I have not installed multiphase generating machines in the station, but have used a special design of rotary converter run from the continuous-current machines. Such rotaries have to be very specially designed, since, in the case of the current becoming displaced in phase, they are apt to race dangerously. This is a particular case, designed after determining the average current consumption in any part of the system, when the ratio between the average and the maximum is approximately known from experience, so as to impose the minimum fixed losses, or, in other words, to insure, under average conditions, maximum efficiency. Were the number of cars doubled I would locate sub-stations approximately at the feeding-in points, and would use multiphase transmission.

An advantage in the use of rotary-converter stations is that at constant speeds such machines will give constant voltage regardless of the load or the drop in the lines (provided this be limited to an economical amount) or the regulation in the transformers, so that such machines can be made to supply simultaneously and satisfactorily both traction and

lighting installations. To justify this statement I instance tests recently made on some 900-kilowatt rotary converters from which full load could be thrown on or off from one to the other machine without any perceptible variation of the continuous current voltage.

In the designing of a multiphase system selection has to be made between quarter and three-phase. The three-phase system has the important advantage that but three-quarters of the weight of copper is required, as with either single or quarter-phase transmission. Considered, therefore, with the energy factors common in multiphase working, the three-phase system gives better transmission efficiency with the same section of copper in the average case as continuous current.

Another advantage is gained when the transformers are delta-connected. Any one of the three can fail, and the other two will deliver phase currents to the rotaries. There is practically no difference as to efficiency or working between tri-phase and quarter-phase rotary converters. In installations making general use of rotary converters feeding into a network at constant voltage, it is necessary to observe some care in selecting the high-tension mains, and in securing engines with approximately constant angular velocity. An engine, to be entirely satisfactory, should not produce by variable velocity a phase displacement of more than five degrees per half cycle from that of constant velocity. The transmitting mains should be designed with comparatively small drop, so that the rotary converters work properly in parallel in different stations, and so that the rotary converters can generate constant voltage with a varying load, without too great phase displacement. If proper precautions are not taken in these matters, rotary converters will not operate satisfactorily in parallel, and are likely to give a great amount of trouble from sparking and irregular variation of voltage.

For working with "rotaries," I would also point out the necessity of arranging the mains so that the current in each phase is delivered approximately at the same voltage. I have recently been conducting some tests on "rotaries" working on triple-concentric mains. At first the current in the different phases varied by about 10 per cent., and the rotaries worked unsatisfactorily; when, however, the electromotive forces were equalized the rotaries worked with entire satisfaction. The conclusion to be drawn from this, for three-phase working, is that the cables should have equal inductance, equal capacity and equal resistance in each circuit.

In installations which I have designed I have used cables drawn in conduits, and with manholes approximately 100 yards apart, so that the cables can be readily replaced or supplemented to meet the demands of the service. Armored cables laid in a common trench are objectionable, in that the burning out of one is quite likely to destroy its neighbor.

By far the most difficult problem to solve at the present moment in large multiphase stations is in connection with the switching apparatus. Circuit-breakers have been devised for continuous currents that will open at any current to be met with in practice. In the case of alternating currents the same perfection has not been made. I recently examined the plans of a 70,000 horse power station, and could not but feel that the success of the whole installation was dependent upon the switching arrangements.

In this discussion I have assumed that the distribution in a traction system would be by continuous currents. I have seen nothing that would lead me to believe that any other system will come into general use.

The next point for consideration is as to what form of apparatus should be used for conducting the electricity from the distributing mains to the car—whether it should be the single-wire overhead-trolley system with earth return, the two-wire system with return overhead, or with this last connected up as a three-wire system with the middle pair of trolley wires acting as a neutral, or whether a conduit system should be used. The valid objection to the single overhead-trolley system, neglecting the aesthetic one, is in the use of the earth as a return circuit. Troubles from electrolysis have been frequent in the United States, where the electromotive-force drop in the earth return is not limited by legislation. Owing to the stringent regulations of the Board of Trade, little trouble has yet been experienced in England or on the Continent, where similar regulations are in force. I pointed out, in a paper which I read before the Institution of Electrical Engineers, that with even very small electromotive forces a certain percentage of the current in all cases leaves the rails. With amounts of copper commercially permissible, either sub-stations at frequent intervals or boosting machines, such as have already been described by Major Cardew and myself at the Institution of Electrical Engineers, are necessary to bring the electromotive-force drop down to two or three volts, which in most cases of municipal working is the safe limit. If the electromotive force exceeds this limit trouble from electrolysis will probably occur at some date more or less remote, according to the local conditions as to the location of the earth return in respect to the gas and water pipes and the nature of the soil.

The double overhead-trolley system eliminates the possibility of trouble from electrolysis. In the case, however, of most cities, where numerous lines converge at certain points, the double overhead con-

struction would be complicated and objectionable in appearance. The same applies to the double overhead three-wire system. This last system has great advantages, however, and when used in connection with rotary converters, which act both as converters and equalizers, it is possible to operate tramways over very long distances from a single generating station.

The conduit system has been used in various American and continental cities with a considerable degree of success. The advantage of this system is that it can be a doubly insulated system, avoiding danger from electrolysis, and that there are no overhead wires. An additional rail at the side, or pair of rails between the tracks along the slot, has to be set off against the overhead wires on making comparison between the two systems as to appearance in the street.

In general, corporations are in a better position to install conduit systems than private companies, since corporations can borrow money at low rates of interest, and have not so great amortization to consider. Further, corporations, frequently having the control of gas and water pipes, can arrange matters so that the conduits can be put in at a less first cost. In some cities I believe the installation of conduits under a dual management would be impracticable, since the conduits would interfere with the gas and water pipes to such an extent that the conduits could not be installed, except by such general rearrangement that local consent could not be obtained. Undoubtedly, in the case of heavy storms, the conduit system is more troublesome than the overhead system. I had some examples of this in my recent visit to the United States. In New York it has been found necessary to employ an elaborate system of double-throw switches, so that if a part of the positive side of the system goes to earth, it can be put

greater economy in working, it would seem that in many cases to sacrifice somewhat in electrical efficiency at the beginning and provide for a possibility for practically unlimited growth, either as to capacity of power or area of district supplied from a central power station.

Storage Batteries and Railway Power Stations.

By ROBERT MCA LLOYD

PART I.

A difficulty confronting us is that very few operators of railway power stations have any data showing what they are doing. Electric light managers seem to take more interest in the output of their stations, and in many cases maintain a system of records of work done, but the manager of a trolley road is usually contented with superficial observations of the switchboard and the comforting fact that the cars are running.

We always find these managers greatly surprised when the actual state of affairs is shown to them on paper, and I believe that this Institute would be astonished at the results of a thorough research into the load curves of the railway plants of the entire country. You are, of course, prepared for the statement that the average load on a railway power station for a given period is much less than the maximum load occurring during that period and much more than the minimum, but it is not generally understood that the maximum load for the same period is apt to be far below the capacity of the generating plant in operation. As an illustration of this fact I show in Fig. 1 some data on a typical railway plant when 35 cars were running. We have not discovered any railway plant where this is not

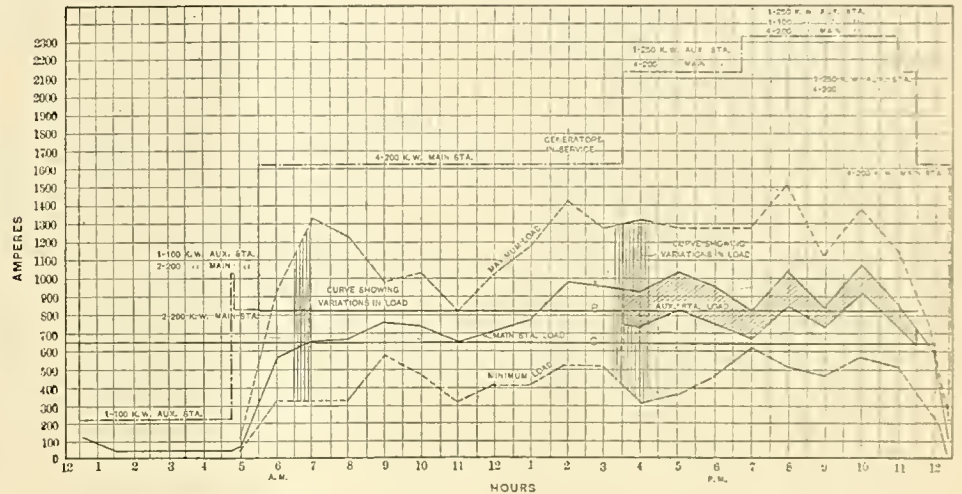


FIG. 1. STORAGE BATTERIES AND RAILWAY POWER STATIONS.—CURVES SHOWING VARIATIONS OF LOAD

on the negative side and the negative on the positive side.

The Dublin station has been designed to work all the cars in the city of Dublin and its suburbs. It is centrally located, and at the same time has exceptional facilities for coal and water supply. The coal is handled automatically from the ship to bunkers over the boilers, and from thence it is weighed separately into each boiler. The boilers are of the water-tube type, and the piping is on a system devised by myself, which I have termed the "by-pass" system, since each pair of boilers normally supplies its corresponding engine, but can, by means of the "by-pass," supply any other engine. The engines are of the vertical cross-compound type, 20 inches and 40 inches cylinders, 42 inches stroke and 90 revolutions.

In conclusion I would point out that the mistake most frequently made has been in underestimating the amount of power that may ultimately be required in a traction system. Both the size and type of machinery in a generating station should be determined in respect to the maximum output of the station. Having regard to the present regulations of the Board of Trade and to economy in transmission and distribution, the limit for a 500-volt continuous-current station is usually reached at 5,000 kilowatts' output. Beyond this, a multiphase system of transmission with rotary transformers for continuous-current distribution becomes necessary for most economical working, since experience has fully demonstrated the greater economy of working from a single central power station. The "universal" station is the multiphase station, since it can meet every condition with a single type of generating machinery. As pointed out in the paper, however, the distance of transmission, amount of power and the nature of the load are the factors determining whether a continuous-current or a multiphase system is best in particular cases.

Having regard to lighting experience in the large American cities in which the three-wire system was originally installed, and which is now being replaced by a three-phase system with sub-stations to secure

true, and I believe that the data on most of the railway plants of this country will confirm my statement. The first explanation of this would be that such a surplus capacity is necessary for reserve to meet emergencies, but I do not find it to be a useful reserve, and shall refer particularly to Fig. 1, taking this station because, from the standpoint of the manager, engineers and attendants, it is dangerously overloaded and has no reserve. In fact, it was necessary to add to the capacity at once to make it safely operative.

I obtained these data on the day of heaviest travel in the whole year. It will be noticed that the highest point reached was within the capacity of the main station, and yet it was necessary to start up an auxiliary station. The central solid line shows the average load, and the upper and lower lines show the limits of the fluctuations occurring from moment to moment. The method pursued in getting these curves was to divide the day into half hours, and during the first five minutes of each half hour take the highest and lowest ammeter reading in each minute; these readings are plotted in the upper and lower curves; also to take ammeter readings every five seconds, and obtain the average of these readings as the point in the curve of averages. Another convenient method of obtaining the curve of averages is by wattmeter readings. Among some of the interesting features in this diagram may be noticed the fact that the nominal capacity of the generating apparatus was about 400 kilowatts in excess of its maximum output occurring at about eight o'clock in the evening, and that the average output at this time was about two-thirds of the maximum. The excess of nominal capacity was not so great at seven o'clock in the morning, but two in the afternoon, when other high points occurred, but as it was known that the morning peak would be of short duration, the engineer decided to run through it without the auxiliary station, and in the afternoon the load increased more rapidly than was expected, and the auxiliary was not ready

¹ Read before the American Institute of Electrical Engineers, New York and Chicago, February 15, 1899.

to go into operation on short notice, consequently obliging the main station to groan under a dangerous load for an hour or so.

It will doubtless occur to some that this station apparatus has been overrated, or that the engineer was incapable or overcautious, but the fact remains that similar data are obtained in very many stations, and that in many cases the apparatus has been subjected to satisfactory tests before acceptance by the purchasers. It may be possible to build engines which regulate at all conditions of load, and at the same time use steam satisfactorily at maximum load, but I do not find such engines commonly in use. Further than this, there are many very good engines in use which cannot be safely operated at anything like maximum load if that load is liable to sudden variations. I realize that you may suggest all sorts of schemes for getting a better output from the plant illustrated by this curve, and you may wish to ask some questions about this apparatus, but experience convinces me that the men who are most likely to be consulted about such a station will recommend more generating plant, and the truth is that there are so many good salesmen pushing engines and dynamos that station managers frequently fail to get full duty from the machinery which they are operating already. It is not merely that the storage battery has been neglected, but any of us can see in railway power houses throughout the country, where the managers have been persuaded to increase their generating plant, that attention to a few details, such as steam piping, would have brought their output up to requirements. Assuming, however, a station equipped with the best obtainable apparatus, and operated under the most advanced laws of station practice, in the absence of a storage battery, there would still be much more apparatus running than would appear necessary from the load diagrams.

The generator salesman says in reply to this proposition that his apparatus is cheap, and that it is good to have plenty of it, but one generally finds that where there is plenty of apparatus available the engineer is tempted to keep too much of it running, and therefore running at low efficiency.

Of course, railway power stations have individual characteristics, and it will not do to assume that they all need storage batteries, but there are certain features of railway power requirement which are common to the problem everywhere, and which invite consideration for the storage battery.

The curve characteristics of electric-light supply are well known, and much information about electric lighting has been brought out in the committee reports of the National Electric Light association for 1896 and 1897 and by Mr. Hammond in his paper before the British Institution of Electrical Engineers in March, 1898, but the possibilities are more varied in railway work, and, as far as I know, there has yet been no systematic research into the economy of railway power stations, the only published data on the subject being contained in the paper read before the American Street Railway association at Boston last September by R. W. Conant.

In my endeavor to point out some of the uses for a storage battery, I shall take as a typical station that shown in Fig. 1. It is located in a Pennsylvania town of 50,000 inhabitants. The railways radiate from the center of the town to distances of three to nine miles. There are six branches, and the power station is located two miles out on the longest branch. It has railroad and water frontage. The small auxiliary power house is the result of a recent consolidation and is close to the main house. There are three distinct ways of using a storage battery with this power plant. Taking up the figure, we find first the great fluctuation between night and day load; second, the fluctuations occurring from hour to hour; and, lastly, the superimposed fluctuations occurring from moment to moment. We shall call a battery of sufficient capacity to level off the night and day fluctuations "large;" a battery for leveling the hour to hour fluctuations "medium," and a battery to level the momentary fluctuations "small." It will be seen at a glance that the small battery will reduce the requirements of the generating plant to a capacity sufficient to meet the demands of the average load shown in curve A.

The battery must be able to discharge at 650 amperes for momentary periods, but its capacity in ampere-hours is unimportant. It will cost less than generating capacity for the same work, and a large part of the excess of capacity over requirements shown in the diagram will be saved. It will save some depreciation on the generating apparatus, and its own depreciation will not cost more than the depreciation of generating apparatus of similar capacity. It will have sufficient storage capacity to run a few night cars and lights when the engines are shut down. If located at a point nearer the center of feeder distribution than the location of the generating station, a saving in copper will be effected. Inasmuch as the investment will not be increased by including such a battery in this railway outfit, all the saving in fuel due to a steadier load and the operation of less generating machinery will be clear gain to the credit of the battery.

Line B at 815 amperes show the average load for 24 hours of the day, and a "medium" battery to reduce the load to this straight line would have a capacity of 1,300 ampere-hours. It will cost about twice as much as a "small" battery, but will not add enough to the cost of the installation to bring the investment up to the total now in generating appa-

ratus alone, and presumably necessary if no battery is used. This battery will have all the advantages of the small plant, with wider limits of operation. The station circuit-breakers may be set 650 amperes higher, and there will be greater convenience throughout the station in operating at a fixed load. There will be a marked effect on the efficiency of all departments of the station, and all the apparatus will yield a higher output in proportion to investment and cost of operation.

Line C at 650 amperes shows the average load for 24 hours, and a "large" battery capable of leveling off this load will have a capacity of 3,000 ampere-hours. It will cost approximately twice as much as the "medium" battery, and will have all of its advantages. It will cost as much as the generating machinery displaced by it. It will add largely to the flexibility of the station. This battery could be discharged momentarily at 3,000 amperes, which will put the circuit-breaker limit of the station at about 3,600 amperes, instead of 2,300, with all the present apparatus. It may be discharged at 1,500 amperes for one hour, which will be sufficient to cover load peaks that would stall the 1,150-kilowatt generating plant completely.

In cases of extreme necessity the entire system might be carried by this battery for several hours. The ability to carry sharp peaks is a distinct addition to the earning power of the system. Such peaks often signify the collection of fares which would be lost if the system were not flexible, and some managers keep up enough station capacity to carry a few holiday crowds, while for 99 per cent. of the whole year it is earning nothing. Other managers do not attempt to carry special crowds. The large battery will give the manager an opportunity to get all the money that can be made out of such business without feeling that he has made any investment for the purpose. Of course, the capacity of the system is limited also by the investment in copper, but in many cases the battery may be located so as to facilitate the distribution of power.

There is no reason why a railway power station of this capacity, running night and day at a constant load, should not attain a fuel economy as high as that of the well-known Chestnut Hill pumping station at Boston, which would be equivalent in electrical work to 557 watt-hours per pound of coal. Curve A, Fig. 1, shows for one day's work 7,800,000 watt-hours, which required at the above rate seven tons of coal, and, assuming that the battery would only have 75 per cent. efficiency, and that 25 per cent. of the entire day's work would go through the battery, one-half ton of coal would be added to this consumption, making 7½ tons of coal a day for this plant running with a large battery.

The battery efficiency in such service as this has been found in most cases much higher than 75 per cent., and in some cases over 90 per cent., so my estimate is clearly on the safe side.

On the day when these data were obtained 15 tons of coal was burned, or twice as much as would be necessary with the battery outfit. The battery would therefore save, at \$2 a ton, \$5,474 per annum in coal alone.

The number of men in the station is now the same night and day, and there would certainly be no increase in the labor item, whereas it is probable that one man on each shift might be dispensed with if the plant were reduced by the battery, in which case there would be another saving of \$1,200 per annum. The battery would also save water, oil, waste, etc., and there would be minor advantages, such as more constant potential on the line, less annoyance from circuit-breakers, no fear of sudden demands on the generating apparatus and the disagreeable possibilities incident thereto.

In the following table some figures are tabulated for the purpose of comparing four different layouts to meet the requirements of the railway system referred to in Fig. 1:

TABLE REFERRING TO FIG. 1.

Lay out with	Cost of generating apparatus.	Cost of storage battery.	Total cost of station plant.	Cost of coal per day.	Cost of coal per annum.	Saving in coal.	Sav. in coal and sav. in int., 5 p. c.
1. No battery..	\$115,000	.....	\$115,000	\$30	\$10,950	.....	.....
2. Small battery	60,000	20,000	80,000	25	9,125	1,825	3,575
3. Medium "	50,000	35,000	85,000	20	7,300	3,650	5,150
4. Large "	40,000	70,000	110,000	15	5,475	5,475	5,525

CONTINUATION OF TABLE.

Cost of real estate and buildings.	Repairs and depreciation.	Saving in labor per annum.	Saving in water, oil, waste, etc.	Total saving.	Estimated addition to receipts.	Net advantage in operation.
1. All the same.
2. All the same.	191	.....	3,675	.....	3,675
3. All the same.	200	.....	5,350	1,000	6,350
4. All the same.	1,200	.....	7,025	5,000	12,025

I have assumed \$100 per kilowatt as the cost of complete station apparatus without batteries. This figure might have seemed high a year ago, but in view of the rising prices of such material I think it is only conservative.

It is rumored that an electric car line is projected from Oelwein, Ia., to Strawberry Point, Elkader, Monona and Watkon, Ia.

CORRESPONDENCE.

New York Notes.

NEW YORK, February 20.—There has been a slight delay in the sale of the stock of the Edison company to the New York Gas and Electric Light, Heat and Power company. Spencer Trask & Co. and Vermilye & Co. have issued a circular letter to the stockholders of the old company, stating that "owing to the illness of one of the counsel, the completion of the deposit agreement for the deposit of the stock of the company with the Central Trust company has been delayed, and therefore the time has been extended from February 15th to March 5th." The circular further said that the "deposit agreement will, it is expected, be issued this [last] week, and the Trust company be ready to issue its certificates in exchange for the deposit of stock."

Aaron De Grauw of Jamaica has brought an action in the Supreme Court against the Long Island Electric Railroad company, the Brooklyn Heights Railroad company and the Brooklyn, Queens County and Suburban Railroad company, and Johnston Livingston, president of the National Express company, with the idea of securing an interpretation of the law with reference to the right of surface railroads to carry freight and express matter on their lines in this state. The action is brought to restrain the defendants from operating trolley express cars along Washington street in the village of Jamaica, on which the plaintiff is an abutting property owner. The plaintiff alleges in his complaint that the Brooklyn Heights and other defendant companies have entered into an agreement with the National Express company providing for the running of box and freight cars over the trolley lines in violation of the laws of the state. Justice Marean reserved decision.

At the request of the counsel for the Astoria Light, Heat and Power company, the hearing at Albany on the measure to distribute light and heat, manufactured at Astoria, in New York city, which was set down for last Thursday, was adjourned until Thursday afternoon of this week. Assistant Corporation Counsel Thomas J. Creamer of New York appeared and stated that some method should be adopted of requiring companies securing such franchises as that contemplated in the Astoria bill to pay the city a fair sum for the franchises granted.

Our legislators at Albany—or some of them, at any rate—thinking that corporations doing business in public streets do not pay enough for the privilege, are considering a new scheme. Senator Ford has introduced a bill which proposes to tax as real estate the franchises and rights of street surface railroad companies, gas, electric and telephone companies, and other transportation corporations. This bill was discussed last week before the Senate committee on taxation and retrenchment. Another hearing will be given on March 2d. Mr. W. K. Bronk, representing the Mutual Gas Light company of New York city, declared that such a law would compel the gas companies to pay taxes twice on the same property, as they now pay a franchise or real-estate tax. Judge Charles F. Brown, representing the Metropolitan Street Railway company, said that the measure was not only uncalled for, but unequal in its operation. He asserted that the Metropolitan company now paid more taxes than any other corporation in New York city. The idea that the railroad companies were escaping just taxation was an erroneous one. He advised the committee to continue the present method of taxing gross receipts of street-railroad companies, and said that this was the only fair method of taxing them. Mr. Francis B. Thurber, president of the United States Exporters' association and a member of the New York Chamber of Commerce, declared that the enactment of the Ford bill would but accentuate the present legislative policy in this state touching corporations, which has driven millions of dollars of capital to other states. He presented resolutions of the Chamber of Commerce in opposition to the measure. John H. Crosby and R. A. Cooney of the Knights of Labor favored the bill. They declared there would be no trouble in getting at the equitable value of the franchises. E. M. Daly, a delegate from the Central Labor Union of New York city, in urging a favorable report upon the bill, declared that the workmen approved it, that it would tend to simplify the tax laws and would make property which cannot escape into New Jersey pay its just share of taxation. Ernest H. Crosby of the Social Reform Club of New York city favored the bill as the first step in the direction of freeing New York city and the local political leaders and courts from the control of the corporations.

A curious complaint comes from Westchester County. It is asserted that the introduction of the electric railway with cheap fares to New York is giving the police of that county no end of trouble and annoyance. For to cents passengers are now carried from the Battery to Yonkers, Mount Vernon, Pelham Manor and New Rochelle. The low fare, the police say, has proved an inducement to thieves, pickpockets and mendicants to pay frequent visits to the suburbs, where the number of policemen is limited and they have less risk of detection than in this city. Since the trolley line has been opened between Mount Vernon and New Rochelle there have been almost a dozen burglaries, while beggars annoy people on the streets, requiring the constant attention of the police. Formerly, the police say, they were able to watch the railroad stations and catch many of the thieves

as they were coming into or leaving town, but now crimes are committed and the offenders jump into a trolley car and escape. It is likely that if the influx continues the appropriations will be increased in order to put an additional patrolmen, which seems to be the simple remedy required. The people of Larchmont Manor, influenced by the experience of other communities, have declined to entertain the application of a company which desired to build a line in the Manor, and thus the trolley is cut off from reaching the northern part of the county. The trolley agitation in Westchester County was begun several years ago to help the local merchants, but as soon as a town or hamlet became connected with New York the shoppers have immediately gone to the city to patronize the larger stores. As a result many of the merchants and property owners who once favored trolley lines are now complaining at the turn affairs have taken.

Among recent New York state incorporations I notice the Horseless Vehicle company of this city. The capital is placed at \$150,000 and the directors are Frederick W. Danton of Hollis, John H. Eldert and H. G. Fleck of Richmond, and Abraham Both and Harold D. Bernstein of New York. M. S.

PERSONAL.

The well-known Daniel C. Hemingray of the Hemingray Glass company, Covington, Ky., made a flying trip to Chicago the early part of this week.

F. C. Phillips, president of the Elwell-Parker Electric company of Cleveland, was in Chicago last week, looking after the interests of his company.

E. S. Carpenter has succeeded F. W. Ferguson as treasurer of the Walker company. It is believed that the office and shops of this company in Cleveland will be continued by the Westinghouse interests.

Mrs. McCumber, wife of the senator-elect from South Dakota, was, it is said, formerly a resident of Fargo, where she was employed as assistant manager of the Western Union telegraph office. While still Miss Jennie Schorning, she was transferred from Fargo to the Wahpeton office. Mr. McCumber met her in the latter town.

Mr. E. B. Ellicott, city electrician of Chicago, addressed the Chicago Electrical association on February 17th on "Police and Fire-alarm Systems of Chicago." His paper was illustrated by apparatus. Mr. Ellicott also gave an illustrated address on "Present Underground Electric Trolley Systems and Their Applicability to Chicago Street Railways," before the Engineers' Club of Chicago on February 21st.

Mr. William E. Baker, for several years superintendent of the Metropolitan West Side Elevated Railway company of Chicago, has accepted the position of general superintendent and chief electrical engineer of the Manhattan Railway company of New York. As Mr. Baker has probably had more experience in the actual operation of elevated electric railways than any other man in the country, it looks as though the last remaining doubt of the electrical equipment of Manhattan had been removed. He had charge of the construction of the Intramural road at the World's Fair and afterward became connected with the Metropolitan company.

The best in the world in the line of telephone and telegraph improvements is none too good for Australia, according to Timothy Howard, superintendent of the government-owned telegraph and telephone systems in the colony of Victoria. Mr. Howard arrived in Chicago on February 20th, says the *Chicago Record*, and registered at the Palmer House. He is touring the principal cities of America and Europe for the purpose of observing the various systems of telegraphing and telephoning, and upon his return to Australia he will incorporate the advanced ideas with which he has come in contact on his travels into the conduct of the plants of which he is in charge. Mr. Howard bears a letter from Sir George Turner, premier of the Australian colony, to Mayor Harrison, and he will make a special study of Chicago's fire-alarm telegraph system.

The firm of Barton & Brown (George P. Barton and Charles A. Brown), patent lawyers, Chicago, has been dissolved by mutual consent. Both Mr. Barton and Mr. Brown will continue the practice of patent law, dividing the offices which they have heretofore occupied in common. Mr. Brown has formed a partnership with Mr. George L. Cragg, who has been with the firm of Barton & Brown ever since it was organized, and prior to that time had a thorough technical and scientific training. The firm

name will be Charles A. Brown & Cragg, and its suite of offices will be at 1450 Monadnock building. Both Mr. Barton and Mr. Brown are widely known and highly esteemed by the members of the electrical fraternity in the West. Collectively, they have upheld the best traditions of the patent bar, and individually they cannot fail to pursue the same line of honorable conduct.

S. M. Hamill of the Brush company has been interviewed for the *New York Sun*. He announced himself to be an out-and-out expansionist and said: "I meet a great many people in various parts of the country connected with the electrical industry, and, with few exceptions, they are all for expansion. I do not mean that they believe in the acquisition of foreign territories, making them into states, and having them represented in our government, but they are in favor of the development and expansion of our foreign commerce. So far as China and Japan are concerned, the prospect for a large business in the electrical field is enormous, and if we are going to ship millions of dollars' worth of apparatus to these countries, we most assuredly will need a powerful fleet to protect our interests and make our merchants respected. Those who are against the retention of the Philippines as a base for our navy in the East Indies and Chinese and Japanese waters simply know nothing of a manufacturing company doing business in a foreign country."

ELECTRIC RAILWAYS.

The McGowan syndicate's purchase of the Citizens' Street Railroad company's franchise and plant has stirred up much opposition in Indianapolis. The combine is regarded with suspicion, there being a feeling that the deal is a cover for a scheme to secure some undue advantage from the city. The new company offers the city about \$45,000 a year for the life of the franchise.

ELECTRICAL SECURITIES.

A deed of trust has been filed with the county recorder at Los Angeles, Cal., from the Los Angeles Railway company to the Union Trust company of San Francisco, for \$5,000,000, as security for a bond issue of a similar amount on the principal street railways of Los Angeles.

MISCELLANEOUS.

An "open discussion of the electrical business" as affording a career for young men is announced by the Y. M. C. A. Electrical Club of Chicago for the evening of February 24th at Association parlors, 153 La Salle street.

The authorities who have charge of the Philadelphia public buildings do not hesitate to express themselves in very forcible language against the depredations committed by women visitors and others who are supposed to do the stealing under the guise of souvenir hunting. The particular object of these polite thieves is the taking away of the incandescent electric-light bulbs. So many have been taken of late—in fact, nearly every one in the building that could be conveniently reached—that the commissioners are seriously thinking of making an example of the first offender that is caught, no matter who he is.

TRADE NEWS.

The Chicago office of the Sprague Electric company has been removed from the Marquette building to suite 609 Fisher building.

It is announced that the death of Mr. Bunnell will not interfere with the business of J. H. Bunnell & Co. of New York, which will be carried on as usual.

The Ohio Brass company of Mansfield, O., has a new building, very much larger than the old one, and, with new machinery, is prepared for a greatly increased output.

Eugene Munsell & Co. of New York and Chicago report a gratifying demand for their India and amber mica, of which they make a specialty for electrical insulation. Some exceptionally large orders have been received at both their Chicago and New York addresses.

The Mercer Electric Machine company of Dawson, Ga., manufacturers' agent and dealer in electrical specialties, will discontinue business soon. Mr.

Walter A. Mercer, who has been connected with the firm as manager, will make Indianapolis, Ind. his headquarters after March 1st.

BUSINESS.

The Leschen-Macomber-Whyte company, 19 and 21 South Canal street, Chicago, describes guys in an interesting manner in a little folder that will doubtless be sent to anyone on application.

The American Impulse Wheel company of New York reports some very large electrical-transmission work in hand and most favorable results from all its installations. The company is building up a large home and export trade.

The Electric Appliance company is calling attention to the fact that it is not too early for the alert station manager to make his preparations for protection from lightning during the early spring storms. It is pointed out that we frequently have quite heavy lightning in March, and to be safe lightning arresters should be installed early in that month.

The factory of the Peerless Rubber Manufacturing company is said to be running day and night in order to fill orders on time, the demand for the company's special line of packings constantly increasing. The celebrated Rainbow packing, Eclipse sectional Rainbow gaskets, Peerless piston and valve rod packing, Hercules combination metallic stop-valve packing and "Honest John" hydraulic Rainbow core packing are extensively used by all classes of engineers. There were over 1,500 tons of Rainbow packing sold during 1898.

The Western Electrical Supply company of St. Louis, Mo., has recently secured a large amount of weatherproof wire, which it is offering to the trade at a greatly reduced price. This wire, although not new, has not seen sufficient service to damage it to any extent, and is all put up on reels, in first-class condition. The sale of this wire, however, does not in any way interfere with the sale of the company's large and well-assorted stock of new wire of the Roebling make, for which it is agent, and always prepared to meet the market price.

In a recent interview with a representative of the *WESTERN ELECTRICIAN*, C. W. Price of the Montauk Multiphase Cable company, New York, stated that his company would make a most complete and comprehensive exhibit at the coming September meeting of the National Association of Municipal Electricians, to show the multitudinous uses to which multiphase cables are put. Displays will be made of the Montauk cable in connection with all interior adaptations. Telephones, district call boxes, watchmen's time-detector service, electric lights and Game-well auxiliary fire-alarm boxes in circuit therewith, will be shown. Altogether, the company will leave no stone unturned to show the many remarkable features of this novel cable.

Electrical engineers who are not already familiar with the value of micaite as an insulator for commutator segments and rings are requested to write the Mica Insulator company of New York and Chicago. The company makes a specialty of furnishing segments for any style or type of machine and has manufactured some segments recently as long as 36½ inches and four inches in height. It reports a heavy business, both in this country and in Europe. The Mica Insulator company's sheet-insulation manual and data book not only gives the breakdown tests of its insulations, but contains samples of the goods it manufactures. A large stock of micaite plates, cloth, tubes, paper and Empire and M. I. C. compound insulations is carried at New York and Chicago, and also at the sales agencies in Cincinnati, St. Louis, San Francisco and Cleveland.

Charles H. Besly & Co., 10 and 12 North Canal street, Chicago, report numerous large orders for their Helmet oil and Perfection and Bonanza oil cups. Shipments have been made to the J. I. Case Threshing Machine company, Pullman's Palace Car company, Charles Parker company, Crane Elevator company, Brown Hoisting and Conveying company, Cleveland Machine Screw company, Gormully & Jeffery Manufacturing company and Pope Manufacturing company. The last two customers use the oil for assembling wheels and coating steel balls as well as ball bearings and other wearing parts. The Pope people have adopted this oil for use on their chainless wheels. The McCormick Harvesting Machine company, Otis Elevator company and American Steel and Wire company are ordering Bonanza cups for use on their machinery.

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued February 14, 1899.

619,269. Electrical Transmission of Sound. Frank M. Bell, New York, N. Y. Application filed October 12, 1896.

A balanced beam is arranged in operative relation with the sound receiver and carries a resistance; a point makes contact with the resistance; a lamp is in circuit with the resistance, and a receiving circuit is provided with a resistance variable by light.

619,276. Signal-recording Apparatus. Willard L. Candee, New York, N. Y., and Richard Varley, Englewood, N. J. Application filed June 4, 1898.

In the claim the combination is described of a lever pivoted on a universal joint, a recording point fixed thereto, a finger piece on the lever whereby it may be moved by hand into either of four positions, springs normally

holding the lever in a central position, a spring to depress the recording point and a motor-driven recording surface therefor.

619,287. Electric Railway. Justus B. Eitz, Philadelphia, Pa. Application filed January 5, 1898.

Means are provided for operating motor circuits at each end of a train which comprise a common motor circuit, a system, and identical controllers, so each motor can pro-

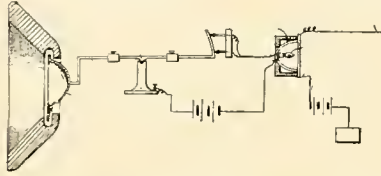
vided respectively with devices for arranging the motors and train-conductor circuit or system in fixed combination on the rear car, and with devices for cutting out the train-conductor circuit or system and reversing the motors on the front car.

619,203. Prepayment Electric-fan Motor. Walter C. Fish and Frank P. Cox, Lynn, Mass. Application filed August 17, 1897.

A coin-carrier is geared to the motor and has a number of coin holders which are adapted to receive and discharge one coin or token after another successively, and means are provided for closing the motor circuit and setting the coin-carrier in motion whenever a coin is present in the carrier and in contact with the terminals of a break in the motor circuit.

619,206. Dynamo-electric Machine. Samuel S. Forster, Schenectady, N. Y. Application filed November 14, 1898.

This invention is a horizontal dynamo with a split-hub spider, a collector fixed to one side of the spider with a space between the other side of the spider and the collector, means for securing the hub to a shaft, a supporting bearing, and means for adjusting the position of the spider without disturbing the collector when for any reason, as by wear of the bearing, the spider is out of its proper position.



No. 619,206.

619,209. Retaining-band for Commutators. John R. Grindrod, Lynn, Mass. Application filed November 5, 1898.

A wire band is employed for retaining the segments in place; a clamp composed of a single piece of wire bent so as to have two rounded ends or loops is situated between the segments and the band, one of the ends being arranged to take most of the strain of one of the ends of the retaining band, and also to receive the opposite end of the band and thereby prevent the wires forming the band from separating.

619,302. Two-rate Meter. Caryl D. Haskins, Newton, Mass. Application filed July 14, 1897.

The current in the field coil is dependent upon that in the work circuit; an armature is permanently connected across the supply mains and moves within the influence of the field coil, and means are provided for varying the current flowing through the armature independent of that flowing in the field coil, the regulating means being local in its action, in that it regulates only the particular meter with which it is connected.

619,307. Electric Motor. Thomas D. Hollick and Frederick W. Hollick, London, England. Application filed December 22, 1897.

One claim is given: In electromotors and in combination, an armature shaft, two separate armatures, the main armature, having a greater length than diameter, mounted thereon, and a field magnet movable with relation to the armatures to surround one or a portion of both armatures.

619,314. Electrical Heater. Charles W. Jones, North Temescal, Cal. Application filed February 10, 1898.

An electric heater comprising a bottom plate, a bottomless box secured centrally to the bottom plate, whereby portions of the plate project laterally beyond the box on the four sides thereof, a casing of greater horizontal and vertical dimensions than the box surrounding the box and secured to the bottom plate, whereby a space is left between the box and casing at the sides and top of the box; a non-heat-conducting material is provided in the space between the box and casing; electric heating devices in the box are provided with electrical connections, and insulating means are included between the box and bottom plate.

619,316. Trolley Catcher and Retainer. William B. King, Willoughby, Ohio. Application filed November 26, 1897.

A catching and retaining device is secured to the base or stand directly beneath the trolley pole. It is adapted to embrace and hold the trolley pole and move with the base or stand in a horizontal direction.

619,320. Trolley. Carl W. Larson, Schenectady, N. Y. Application filed October 31, 1898.

The invention comprises a plurality of trolley poles adapted to engage the same trolley wire, with means for controlling the movement of the contact devices.

619,324. Battery Switch. Roderick Macrae, Jersey City, N. J. Application filed August 18, 1897. Renewed July 25, 1898.

Features enumerated are a row of battery cells, a track arranged alongside or adjacent thereto of substantially the same length as the row of cells, a traveling contact device moving on the track, a series of contacts insulated from each other corresponding to the series of cells and respectively connected with the latter, each contact and its corresponding insulating space equalling in length the distance between the centers of the cells opposite which they are placed, and means for moving the traveling contact device along the track.

619,349. Process of and Apparatus for Extracting Precious Metals from Ores or Slimes. Hugo Klocken, London, England. Application filed April 12, 1898.

The process of extracting precious metal from ores or slimes by electrolysis which consists in agitating a mixture of the ore or lime and an electrolyte in the presence of an anode causing a stream of mercury to descend in a thin film over a metallic surface forming a cathode, passing current through the pulp to the cathode and thereby amalgamating the precious metal, and depositing thereon in an adjacent layer upon the cathode collecting the dissolved mercury and reconveying it to the top of the metallic surface.

619,360. Insulating Alternating-current Circuits. Charles P. Steinmetz, Schenectady, N. Y. Application filed July 15, 1898.

The art of eliminating air from an insulating compound or dielectric consists in substituting a vaporizable compound for the occluded air, and then vaporizing the

compound so that the air is carried away by the change of tension.

619,410. Telegraph-key Attachment. Arthur J. Hendricks, Crockett, N. Y. Application filed August 30, 1898.

With a telegraphic key there is combined a circuit-closing leaf spring connected at one end with the anvil contact of the instrument, and provided at the free end with an up-turned terminal normally exerting a pressure against the operating end of the key lever, a fixedly positioned guide bushing, a pull connection for the free end of the spring passing through the guide bushing, and a controlling lever connected with the pull connection.

619,440. Duplex Faradic Battery. James H. Robertson, New York, N. Y. Application filed April 9, 1898.

In a faradic battery an induction coil differentially wound is placed in combination with an armature influenced by two electromagnets, and adapted to make alternate contact with two points, each of which is in circuit, at intervals, with an electromagnet and a primary wire of an induction coil.

619,448. Electric Burglar-alarm. James Tomney, New York, N. Y. Application filed October 4, 1897.

A plurality of electrical connections forms a plurality of circuits between an indicating point and a guarded structure; a number of variable resistances are located in the connections, and means for changing the resistances and the path of the circuit between the guarded structure and the indicating point are provided.

619,449. Electric Protective System. James Tomney, New York, N. Y. Application filed June 24, 1898.

A system for electrically protecting structures from a central office or indicating point comprising a circuit between a guarded structure and the central office in which a circuit an indicating device is placed, the circuit comprising a plurality of paths, a source of electricity in the circuit and with which the paths are connected so as to contain more or less current, resistances in the paths to compensate for the differences of current in them, whereby the indicating device will be unaffected on a change of circuit from one path to another, and a device in the circuit for changing the current from one path to another.

619,465. Electrical Switch. Arthur Brier, Manchester, England. Application filed December 13, 1898.

This switch has a resistance comprising a movable part, operating means therefor, including a worm spindle, the movable bearings therefor and operating connections leading from the switch to move the bearings.

619,471. Electric Branding Device. Birney Fellowes and Henry Van Hovenbergh, New York, N. Y. Application filed August 2, 1894.

An apparatus for branding a variable design upon a surface or fabric, comprising a series of characters formed of metal and provided with connections for cutting them into an electric circuit, and means for adjusting them into various relations to vary the design to be branded.

619,476. Mechanical Time Switch for Two-rate Electric Meters. James H. Gerry, New York, N. Y. Application filed May 5, 1898.

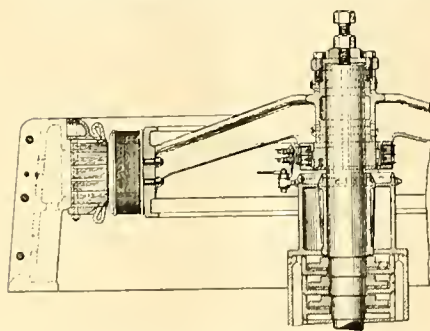
The non-electrical mechanism of a two-rate meter is described.

619,493. Telephone Attachment. Frederick Lind, Jr., Paterson, N. J. Application filed September 20, 1898.

The combination with the receiver, a fulcrumed transmitter arm and the switch hook or hanger of a telephone, of an extension secured to, and movable with, the transmitter arm, a longitudinally adjustable support for the receiver swiveled to the end of the extension and means operatively connecting the extension to the switch hook or hanger.

619,519. Electric Branding Device. Henry Van Hovenbergh, New York, N. Y. Application filed August 2, 1894.

The device is provided with a rotatable disk carrying a series of circularly arranged branding characters, a supporting frame, means for holding the characters normally out of engagement with the surface upon which the frame rests, a guide roller mounted on the frame and bearing upon the contact surface, and means for turning the roller axially so as to shift the apparatus when the handle is operated, whereby a repeated operation of the handle will burn upon the fabric a series of characters side by side.



No. 619,527.

619,527. Motor-vehicle. Clinton E. Woods, Chicago, Ill. Application filed March 5, 1898.

The first claim is: In a motorcycle or vehicle, the combination with a vehicle body of a flexible support therefor, composed in part of an elliptic spring interposed between the vehicle body and the driving wheels, and a motor in engagement with the running-gear of the vehicle and flexibly supported by a movable part of said elliptic spring.

619,555. Telegraph Insulator. Isaac B. Frantz, Allentown, Pa. Application filed August 4, 1898.

An interiorly screw-threaded securing cap is adapted to be mounted upon the cross-arm fastening pin to securely hold the wire and positioning plate in position.

619,618. Ship's or Similar Compass. Ludwig Reil-stahl, Kiel, Germany. Application filed March 20, 1897.

A compass having an electromagnet mounted to swing with the needle thereof, the magnet having its poles placed

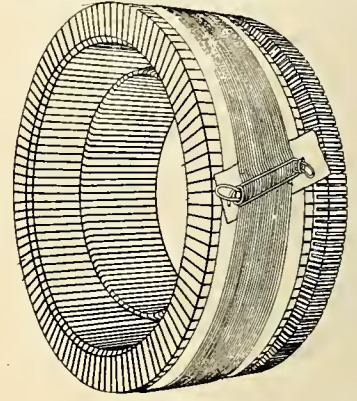
in positions respectively on the sides of the compass needle, and means for controlling the circuit of the magnet, whereby to return the needle from deflection upon the energization of the electromagnet.

619,620. Electric Motor. Conrad L. Rosenqvist, New York, N. Y. Application filed April 4, 1891.

An alternating or pulsating current motor having two field-magnet circuits mounted upon a common core, and means for rectifying the current in one circuit to maintain a constant field magnetism, only one circuit being active at a time.

619,621. Alternating-current Electric Motor. Conrad L. Rosenqvist, New York, N. Y. Application filed June 19, 1893.

The combination with a synchronous single-phase alternating-current motor organized to operate as a starting or non-synchronous motor, wherein the current flows through both the armature and field coils, of a magnet in a circuit-carrying current responsive to or varying with the speed of the motor, and a circuit-closer in the synchronous motor coils adjusted to be closed by the magnet when the critical or desired synchronous speed is reached.



No. 619,299.

619,622. Secondary Battery. Alexander Schan-schieff, London, England. Application filed September 20, 1895.

The process of manufacturing active material for electrodes for secondary batteries which consists in carbonizing a carbohydrate such as a saccharose by treatment with sulphuric acid, mixing with the carbon compound thus obtained a conductive agent, as a lead salt, and converting the mixture into a paste by addition of sulphuric acid in solution.

619,632. Indicating and Recording Mechanism for Measuring Fluids in Motors, etc. John E. Thebaud, Buffalo, N. Y. Application filed February 28, 1898.

One claim is as follows: In an indicating and recording mechanism for measurement of fluids in conduits or motors, the combination with a rack or gear wheel and their respective cams of a pivoted lever provided with separate pawls for giving to the rack bar or gear wheel movements in opposite directions, an intermediate arm on the pivoted lever tripping levers pivoted to the intermediate arm, locking levers pivoted to the frame independent of the intermediate arm and adapted for engagement with the rack bar or gear wheel and the tripping levers, armatures upon the pivoted lever, magnets for operation with the armatures, an electric transmitter connected to the magnets and conduit or motor and means connected with the pivoted lever and the magnets for introducing a local or stronger circuit through the magnets.

619,636. Apparatus for Separating Magnetic Materials. Otto A. P. Trüstedt, Stockholm, Sweden. Application filed July 31, 1895.

The combination with the electromagnet of a magnetic separator, of a generator for multiphase alternating currents, from which each current is led around different poles in the electromagnet so as to cause a wandering field of force to be created in the magnet, which field of force carries away the magnetic particles in a direction different to that in which the non-magnetic particles move.

619,662. Telephone-signaling System. Donald M. Bliss, Brookline, Mass. Application filed April 11, 1898.

A telephone signaling system comprising a local circuit at each station permanently disconnected from the main circuit, electromagnetic signaling mechanism in each local circuit and a transformer at each station, the transformer having one of its coils in series with the local circuit and its other coil bridging the main circuit.

619,667. Electric Printing-machine. George L. Campbell, Dushore, Pa. Application filed October 30, 1897.

The first claim: An electric bulletin, comprising a frame having paper-carrying rollers mounted thereon and means for traversing the frame, positive means acting upon one of the paper-carrying rollers to rotate it, a spring-held locking means acting upon the other roller, and a lever adapted to engage the latter roller to give it a partial rotation.

619,679. Galvanometer. Allen A. Dittmar, Jersey City, N. J. Application filed August 27, 1898.

Invention is allowed for a compound disk of magnetic and non-magnetic balancing metal, the magnetic portion of the disk being in the spiral or snail form while the non-magnetic material fills the remainder of the area comprised within the periphery of the disk so as to produce a disk which is balanced in all positions.

619,687. Electrical Sign. William A. Harvey, Scranton, Pa. Application filed February 23, 1898.

Lamp holders having grooved edges are adapted to engage any one of a series of parallel conductors.

DESIGNS.

30,206. Portable Electric Lamp. Clinton E. Whitney, New York, N. Y. Application filed January 16, 1899. Term of patent, seven years.

30,207. Terminal for Electric Circuits. William H. Baker, Central Falls, R. I., and Frederic E. Kip, Montclair, N. J. Application filed November 8, 1898. Term of patent, 14 years.

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No. 9

New Apparatus at Lewis Institute.

During the 2½ years that has elapsed since the Lewis Institute was opened to students it has demonstrated its usefulness as a school of practical technology. It has shown a healthy growth and has done good work, with the promise of doing still better. The scope of the institution is well adapted to the needs of many boys and girls in a work-a-day community like Chicago, who seek practical instruction or training that can be turned to bread-winning account immediately after acquiring a common-school English education. In general, the Institute is intended to fill the gap between the public school and the university. It takes children below the usual high-school age and carries them to about the first or second year of work ordinarily demanded in American colleges. During that time the latent bent of

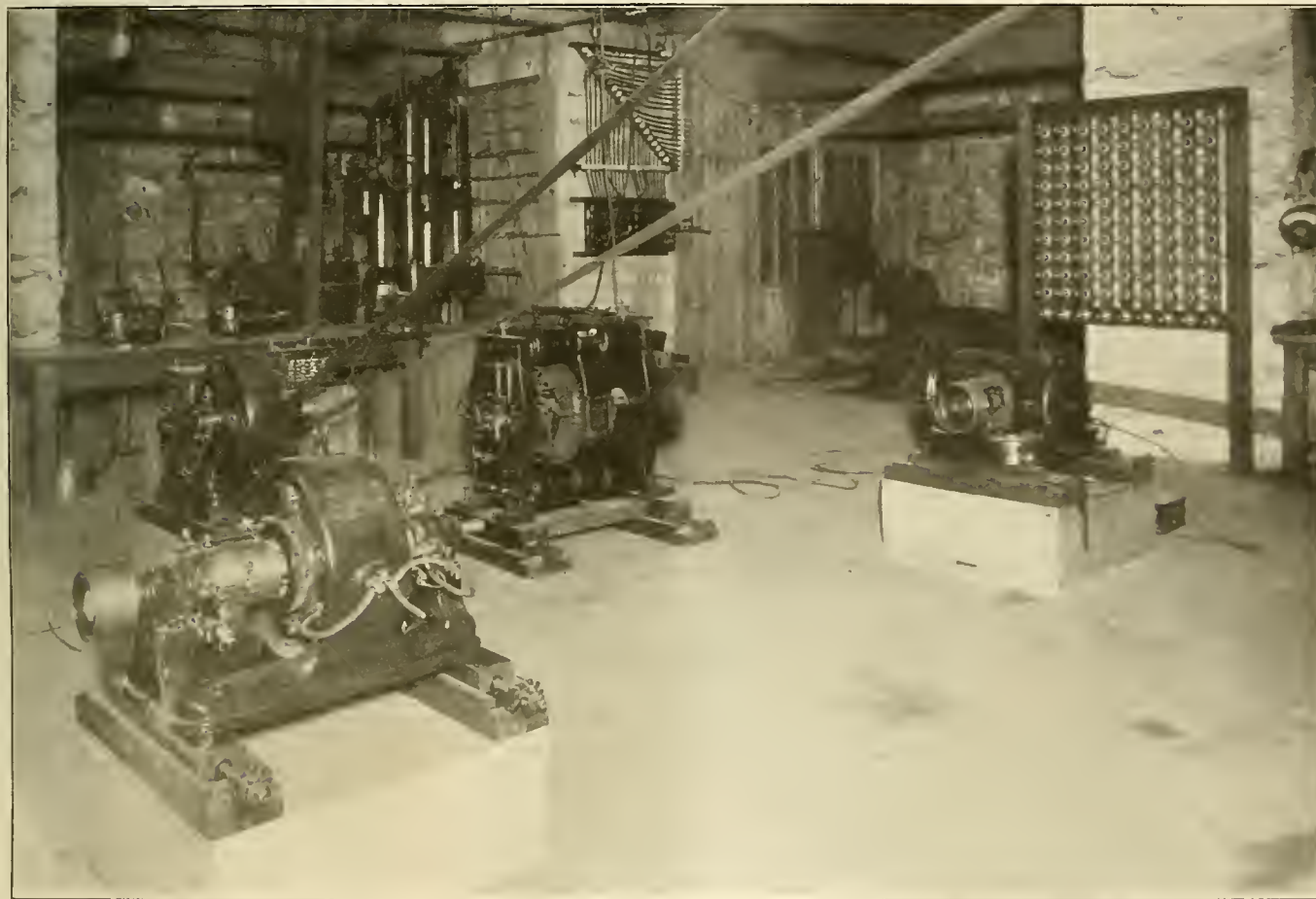
rotary transformer shown in the lower left-hand corner of the picture. This is a sort of combination machine built by the Fort Wayne Electric corporation on the Wood and Churchward patents. It consists of an alternating-current synchronous motor and a direct-current generator. It is a six-pole machine and has a commutator and four brushes on the direct-current side and six collector rings on the alternating-current side. The direct-current generator is of five kilowatts' capacity and with a voltage of 110. The machine is so designed that by altering the leads on the collector rings it can be run on single-phase, two-phase or three-phase current. It is provided with a pulley and can be run by mechanical power as an alternating-current or direct-current dynamo. In fact, the machine seems capable of demonstrating the working of almost any kind of

horse power—drives a blower used to produce forced draft for an Economic tubular boiler, which is set up in the laboratory for testing purposes in the students' instruction.

The electrical apparatus in the engineering laboratory is used under the direction of Fred A. Rogers, the instructor in electrical engineering.

Death of Baron Reuter.

Paul Julius de Reuter, a baron of the Duchy of Saxe-Coburg and Gotha, died at Nice on February 25th. He founded Reuter's Telegram company, which is known the world over as an agency for the collection of news by telegraph. Baron Reuter was born at Cassel, Prussia, in 1816. From the opening of the first telegraph line in Europe between Aix-la-



NEW APPARATUS AT LEWIS INSTITUTE.

the youth toward science, technology or commerce is discovered and encouraged, that he may intelligently fit himself for his work in life. It is not designed to graduate finished mechanical and electrical engineers. The institution is regarded as a preparatory school. However, it offers a six-years' course, and is designed to thoroughly fit the student to enter the junior year of the best universities and technical institutions. But it is intended to aid the young man who must go directly into practical work as an electrician rather than enter an institution for the completion of a technical course. Evening classes have been arranged for the benefit of those who are unable to devote their time to study during the day, and are popular and well attended.

To accomplish its object stress is laid on laboratory work by the students, and the resources and opportunities of the laboratories are being constantly extended. In the engineering laboratory the four new dynamos which are herewith illustrated have been lately added. This laboratory is still far from finished, but the boys make temporary connections of belt or wire and obtain practical experience in it.

Of the new dynamos the most interesting is the

alternating or direct-current dynamo or motor. The normal speed is 1,200 revolutions per minute.

Beyond and above the rotary transformer in the picture is a two-phase Wood-Churchward alternator of the new type. The machine has four poles, and at 1,800 revolutions is rated at five kilowatts and 100 volts. To the right of it is a Wood arc machine, built to supply 35 lamps of 1,200 nominal candle power each. Farther to the right, under the bank of lamps, is a five-kilowatt, 110-volt Wenstrom compound-wound dynamo, with four poles and two field coils. It is driven at 800 revolutions per minute. All of this apparatus is installed for experimental purposes and is quite distinct from the house plant, which is in another room. The four dynamos are arranged to be driven from an overhead shaft to be belted to a five horse power Sprague motor. At present a Straight Line simple engine, turning at 280 revolutions and of about 15 horse power, drives the shafting. This engine is arranged to be run condensing or non-condensing.

The Olsen testing machine, shown on the platform back of the arc machine, is belted driven by a three horse power Northern motor enclosed and bolted to the ceiling. Another motor—a Lundell of three

Chapelle and Berlin, in 1840, he became interested in the electric-telegraph system. He acquired an interest in the different lines as they were opened, and in 1851, when the cable between Dover and Calais was laid, he opened his chief office in London. He had before this been naturalized as a British subject. Mr. Reuter immediately began to establish agencies in different parts of the world and to supply the British press with news. Similar organizations were established by him in America, India, China, Australia and all the continental states. In 1865 he turned over his business to a limited liability company. He retained the position of manager, and in the same year he obtained a concession for the construction of a submarine cable between England and Germany. Mr. Reuter also obtained a concession from the French government for the laying of a cable between France and the United States. This was laid in 1869 and is operated in conjunction with the Anglo-American Telegraph company. The position of baron was conferred on him by the Duke of Saxe-Coburg and Gotha in 1871. In 1878 Baron Reuter retired from the managing directorship of Reuter's Telegram company, but still retained a permanent member of the board of directors.

Some Recent Developments in the Gas-engine Field.¹

By EDWIN RUUD.

Gas-engine engineering is a peculiar and difficult line, probably one of the hardest branches in the entire mechanical field of to-day. This you will understand when you stop to consider that the temperature in the cylinder during the explosion periods is a dazzling white heat, and that many parts are exposed to this high temperature. Add to this the different behavior of the various kinds of gases, and that the whole process is going on within closed doors, so to speak, where you have very little chance to see what is taking place, and you can imagine the difficulties of the problem. It is a wonder that an engine can be made to run satisfactorily under such conditions. It requires a constant association with the subject in order to fully understand and to be able to overcome the numerous difficulties which present themselves. The difficulties increase with the size of the engine, due to the fact that the heat problem becomes more and more troublesome to solve. It is for this reason that the gas engine has not made much headway in the larger sizes. Also, few men have been willing to experiment in large sizes of gas engines, in view of the uncertainty and the abnormally heavy expense connected with the development of, say, a 1,000 horse power gas engine. I shall later on say a few words touching upon large-size gas engines.

I shall in the course of this short talk confine myself to two classes of engines now in use, and shall endeavor to explain or make clear to you the workings of these two kinds of prime movers. This classification is made with regard to the mode of regulation, the cycle being the same in both the "Otto" or "Beau de Rochas"; in fact, this cycle is about the only one used to-day commercially. I shall try to point out the advantages and the disadvantages of these two classes in order. But before I do this, I shall explain the working or principle of the gas engine in general for the benefit of the members who may not be familiar with the underlying principle. [Here the lecturer made some sketches on the blackboard and explained the first principles of design in the gas engine.] The so-called "hit-and-miss" gas engine has been made exclusively until recently, and I shall therefore describe this style first.

The phrase "hit-and-miss" is admirably well adapted for this type, as you will see.

Figs. 1 and 2 illustrate the principles involved in this mode of governing.

The cam shaft *A*, Fig. 1, which operates the exhaust valve *J* and other parts, runs only half the number of turns that the engine does. On this shaft is fastened the cam *B*, which moves the gas valve *G* when the roller *C* is brought in the proper position so as to ride on the cam. The governor *D* controls the position of this roller by the aid of the bell crank lever *E*. Thus, if the speed of the engine is too low, the gov-

valve *J* is opened, and on the return stroke the products of combustion are expelled.

You will see that by this mode of governing one or more charges may be cut out and that the engine either takes in a full charge of gas and air or omits the gas altogether, as the gas-valve stem is only in position to be operated by cam *B* when the engine is running at or below normal speed.

Thus you will readily understand why the "hit-and-

omits one or more charges a momentary variation in speed is the result, and fluctuation is apparent in the lights.

This introduction of two extra belts, shafting and masses to move causes quite a loss in power. The power absorbed by the two belts will be approximately seven per cent. and by the jack-shaft about three per cent., making a total of about ten per cent. taken up by the extra machinery. Even with this

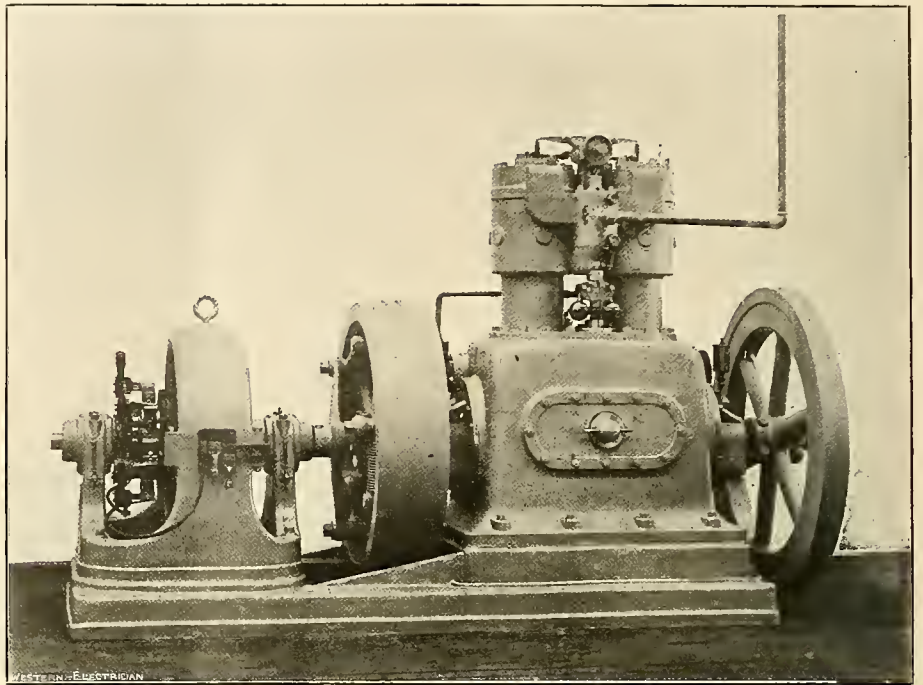


FIG. 4. SOME RECENT DEVELOPMENTS IN THE GAS-ENGINE FIELD.

miss" type of engine is not suitable where a uniform speed is required, and but few of this type are running in connection with dynamos for lighting purposes. Where they are driving dynamos it is generally done as indicated in Fig. 3.

As Fig. 3 shows, the gas engine is belted to the pulley on the jack shaft and from this in turn to the dynamo.

The "hit-and-miss" gas engine must have heavy fly-wheels, and a heavy balance wheel is usually mounted on the jack-shaft in order to obtain an ap-

proximate steady speed. I have even seen some outfits of this kind having a small fly-wheel on the armature shaft. This arrangement, as you will see, takes up a great deal of floor space. The flapping of the engine belt, due to the irregular motion of the gas engine, together with the ordinary hissing sound from the two belts, makes the plant a very noisy one. The variation in the voltage on a 100-volt circuit is generally $3\frac{1}{2}$ to 4 volts during the cycle. That is, when the engine may take in a few charges successively the voltage is steady and rising, but when the engine

auxiliary machinery the speed of the dynamo is unstable and the service unsatisfactory. This type of engine is, therefore, limited to do work where steady speed is not necessary or required. This type of engine has one advantageous feature, namely, that the charge is always ignited under the same pressure, and hence the actual work done by the exploding gases in a given cycle is practically the same for full load as for no load.

Recent developments have proved that the modern type of gas engine is admirably adapted for electric lighting, as its economy is very high, and its speed regulation in a type to which I shall refer has been made as good as that of a first-class steam engine. It is the electric business which has stimulated the experiments in the direction of producing a gas engine which would be suitable for incandescent-lighting work. It is in contrast to the "hit-and-miss" type that I show you illustrations (Figs 2 and 4) of gas engines having the armature on the crank shaft, direct-coupled, or directly belted, precisely as its brother, the steam engine.

Fig. 2 illustrates a gas-engine cylinder and mixing valve of the type which proportions the charge in accordance with the load. The gas and air are mixed in the cylindrical mixing valve *A* in the proper proportions at which the same is set. This ingenious device is in reality a proportional meter, and preserves the proportions between the gas and air whether the engine runs at no load or full load. Thus the governor *B*, in connection with this valve, has absolute control over the amount of explosive mixture to be taken into the cylinder through channel *C* and inlet valve *D*. The charges are ignited by an electric igniter, located at *F*. This igniter, which is fully patented by the Westinghouse Machine company, differs from all other igniters in the respect that it is duplex and the bonnet covers two separate mechanisms. This construction makes it possible to change the connections of the wire from the battery to either set of terminals while the engine is running. If desired, both sets of terminals can be used at one time, thus insuring absolute certainty of ignition. This is often done in large electric-station work.

From this you will see that the last-described mode of governing is similar to that of the steam engine and that for picking up a heavy load it is even in a better position. All charges being proportioned to the load, if the load is suddenly thrown off there is one heavy charge already locked in, which cannot be removed, although the governor acts instantly, and there may be another under way which may be partially reduced by the action of the governor. This tends to speed up the engine a trifle above the normal, but because of the fly-wheels this tendency is so slight that it can be ignored in practice; besides there are very few plants subjected to throwing off the entire load at one. Having described both classes, I shall now dwell upon the gas consumption, and what I say in this respect is applicable only to the Westinghouse gas engine.

GAS CONSUMPTION.

The gas consumption in all engines varies with the

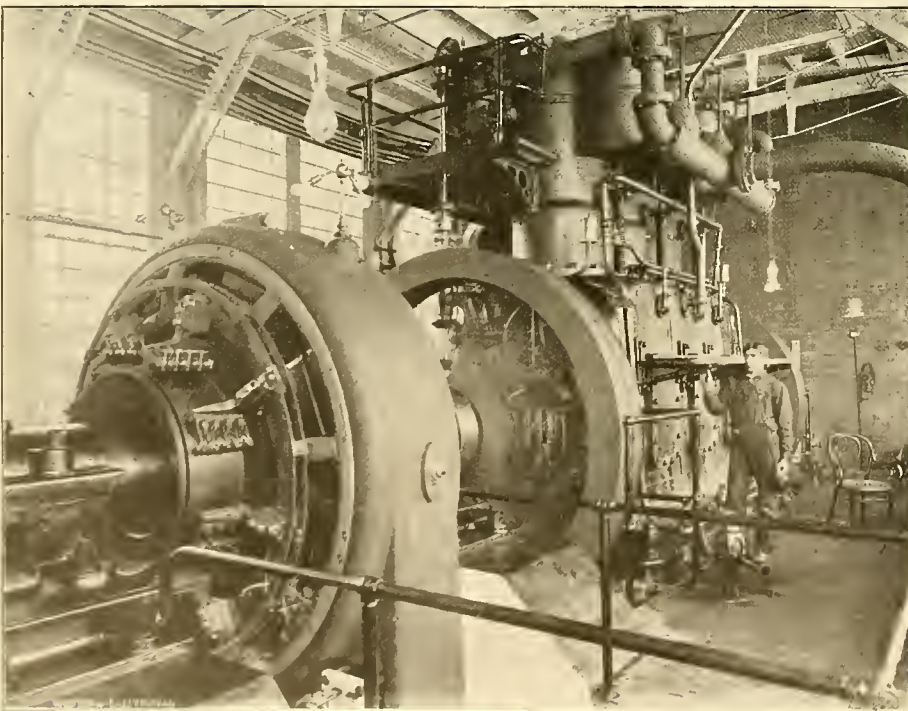


FIG. 6. SOME RECENT DEVELOPMENTS IN THE GAS-ENGINE FIELD —LARGEST GAS ENGINE IN COMMERCIAL OPERATION.

governor will ride closer to the spindle, and this will move the governor lever *F*, thus operating the lever, which moves the roller *C* on its spindle to a position where the cam will strike it, raising gas valve *G* and admitting the gas to be drawn to the inlet valve *H*, where it mixes with the air as it enters the cylinder of the engine. On the return stroke of the piston the charge is compressed and ignited at dead center. Now on the expansion stroke and then the exhaust

stroke will ride closer to the spindle, and this will move the governor lever *F*, thus operating the lever, which moves the roller *C* on its spindle to a position where the cam will strike it, raising gas valve *G* and admitting the gas to be drawn to the inlet valve *H*, where it mixes with the air as it enters the cylinder of the engine. On the return stroke of the piston the charge is compressed and ignited at dead center. Now on the expansion stroke and then the exhaust

¹ Address before the Technischer Verein (Technical Society) of Pittsburgh, Pa.

kind of gas used and also with the size of engine up to certain limits. The average performance of the Westinghouse gas engine, say from 20 horse power upward, is 10.5 to 12 cubic feet of natural gas per brake horse power hour. According to numerous tests with the Junker calorimeter, I have found that the average heat value of natural gas is 1,000 British thermal units per cubic foot. That is, the engine requires 10,500 to 12,000 British thermal units for each brake horse power hour, giving a heat efficiency at the shaft of 25.4 per cent, and 21.3 per cent, respectively. The above are not fancy figures, but represent the everyday performance of the engines while in the hands of the customer.

The indicator cards taken from a Westinghouse gas engine will give the reader an excellent idea of the governing action under overload, rated load, half load and no load. (See Fig. 5.)

Some special engines have been built which have given much better results than the above mentioned, and I have in mind a special 125 brake horse power gas engine which, when tested, gave the phenomenal economy of nine cubic feet per brake horse power. This would give an efficiency at the shaft of 28.7 per cent.

These are good results, but they are not as good as may be expected, and I firmly believe that the everyday performance of a gas engine will within a short time reach 33 1-3 per cent. Some experiments are being made along this line now, and with reasonable show of success. In comparison with this result I quote the gas consumption of the Lenoir engine of 1861, which was practically 90 cubic feet of about 700 heat unit gas per brake horse power hour. This engine was really the first commercial engine offered to the public. The next step was the Otto-Langen free-piston engine, which in reality was the invention of Barsanti and Matteucci, brought out in or about 1867. According to Tresca, the gas consumption per brake horse power was 44 cubic feet per hour. In 1876 Otto brought out the so-called "Otto Silent" gas engine. This engine was a compression engine, and in principle not very different from the "hit-and-miss" engine of to-day. This cycle is called Beau de Rochas, or the Otto cycle, although Gustav Schmidt is probably the originator of it. The consumption of gas was about 30 cubic feet per brake horse power hour. Thus we can see that the efficiency of gas engines has been notably improved.

WATER CONSUMPTION.

It is necessary in a gas engine to have the cylinders and all the parts exposed to the heated gases water-cooled, in order to prevent over-heating of the different parts. This is generally done by letting a stream of water flow through cylinder jackets. As the public at large seems to be ignorant as to the water consumed per brake horse power hour, I shall here state the amount of water required. In winter the consumption of water may be put down at about 30 pounds, and in summer 38 to 40 pounds per brake horse power. In places where water is expensive, this need not be wasted, as by putting up a tank or tanks, according to the size of the engine, the loss of water need not be more than a few gallons per week, or just as much as the evaporation of water from the surfaces of the tanks would amount to. Another way of cooling is by the use of a cooling tower. The water is pumped from a well through the water jackets of the gas-engine cylinder, where it becomes heated, and from there over to the top of the cooling tower, to again return to the well at about atmospheric temperature, to be used over and over. This mode of cooling produces a greater loss of water than that of the tank system, but it is almost always used in connection with large-sized engines. Not long ago I made some tests for the purpose of determining the amount of water necessary for cooling and to determine the heat lost through the same. It was found that 5,121 British thermal units went out in the cooling water, 2,922 British thermal units was converted into work, and 2,957 British thermal units must then be the approximate amount of heat which went out through the exhaust and was lost by radiation. From this you will see that there is still room for improvement toward efficiency. The bulk of the loss is in the cooling water.

THE FUTURE OF THE GAS ENGINE.

Until recently the gas engine has been made in comparatively small sizes only, and, as I have before stated, only for what you may call rough work, that is, where steadiness of speed was not essential. The largest engine in this country, made commercially, was only 100 horse power, having two cylinders and of the "hit-and-miss" type. The public looked upon the gas engine as a sort of "freak," and did not take very kindly to it. The hard times, however, which we have experienced during the last five years or so have done much toward introducing the gas engine. The keen competition and the small margin of profit caused manufacturers and business men to look around for some spot where a saving could be effected in their establishments. An investigation followed which was favorable to the gas engine. The introduction of electricity, calling for prime movers, also stimulated the demand for a cheap and convenient motor, and this, more than anything else, has brought the gas engine forward. When Mr. Westinghouse, about five years ago, commenced experiments in the gas-engine field, he did so because he foresaw a large future demand for the gas engine in the electrical field, if it could be made to give the service that its brother, the steam engine, was doing.

Experiments on a fairly large scale followed, both on compound and single expansion engines. The work was hard and trying, as the obstacles to overcome were numerous, but the results have been gratifying. In the early part of the spring of 1898 an engine of about 650 brake horse power was completed in the works of the Westinghouse Machine company. [Fig. 6 illustrates this engine operating a direct-current 500-volt engine-type generator.] This engine is of the three-cylinder type and has a speed of 150 revolutions per minute. After it was thoroughly tested on the testing foundation, it was erected in the power house of the Westinghouse Electric and Manufacturing company, where it is running in regular commercial service of a severe character.

The engine is direct-connected to a suitable generator and runs in conjunction with one or two steam engines, according to the call on these units for electric current. This engine is by far the largest gas engine in the world, and it is pleasing to record that this large gas engine was built in Pittsburgh. But this engine will not long enjoy the distinction of being the largest one. The Westinghouse Machine company is making drawings and patterns for a 1,500 brake horse power gas engine. This engine is also of the three-cylinder type, and it is designed to run at 100 revolutions per minute. Remarkable economy is expected from this engine, as every possible care is being taken to make it a model of modern gas-engine engineering. It would not be surprising if this engine developed a brake horse power for every 8 1/2 cubic feet of natural gas consumed per

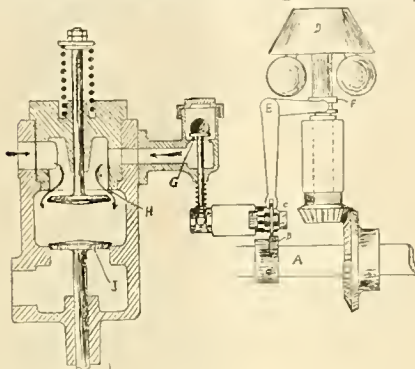


Fig. 1.

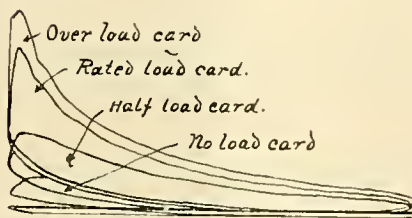


Fig. 5.

SOME RECENT DEVELOPMENTS IN THE GAS-ENGINE FIELD.

hour, or 8,500 British thermal units per brake horse power hour. This would give a heat efficiency of 25.64

— or 30 per cent. at the shaft. When gas engines can be made of such efficiency in large units, they will undoubtedly compete successfully with the most modern steam engine.

A gas engine of such size and efficiency will run day in and day out on less than one pound of coal burned in a good produce gas plant per brake horse power hour. This includes banking of fires and the like losses. It would have to be a high-grade steam engine and boiler plant if it should regularly be able to produce a brake horse power for two pounds of coal per brake horse power hour, twice the amount of fuel required by the gas engine under similar conditions. From the foregoing you will see that the gas engine is no longer limited to special power purposes. It can hold its own as a prime mover, and can be used for almost all purposes for which the steam engine can be used. But all this has not been accomplished in a day. It is now 108 years since the first patent on an explosive motor was taken out by John Barber, and from that time on it may be seen that great improvements have been made.

Receivers for the Fort Wayne Corporation.

On the application of eastern creditors, Judge Baker of the United States Court at Indianapolis has appointed C. H. Worden and Samuel L. Morris of Fort Wayne, Ind., temporary receivers of the Fort Wayne Electric corporation. As soon as possible a trustee will be selected by the creditors and appointed by the court. Local capitalists have subscribed \$500,000 to purchase, reorganize and continue the business at Fort Wayne, and there is but little doubt that the business will in fact be continued without serious interruption. C. S. Knight, for years vice-president and general manager of the company, has resigned. F. S. Hunting has been appointed general manager to succeed him.

Pacific Cable Project.

On February 20th the Senate committee on foreign relations reported favorably for incorporation in the sundry civil bill an amendment authorizing a contract with an American company for transmitting government cablegrams to Hawaii, Manila and Japan for twenty years. The compensation is not to exceed \$175,000 a year, and provision is made that the contract be awarded the lowest responsible bidder who will deposit a \$400,000 bond to fulfill the conditions. At the end of the contract period the rate for government messages is to be one-third that for commercial messages, which are fixed at 25 cents per word to Hawaii and \$1 to Manila, the right being reserved to revise these rates at the end of ten years. The subsidy payments are not to be paid as dividends, but are to form a special fund for renewal and repair of cables.

Information gathered by the Navy Department, in anticipation of action by Congress authorizing the construction of a telegraph cable connecting this country with the new American possessions in the Pacific, has resulted in the suggestion of three routes and the practical abandonment of the route heretofore considered the most practicable. Reports from the Naval Hydrographic Office show that Wake Island, a detached coral formation to the north of the Marshall group, is entirely submerged occasionally, and cannot therefore be used as a landing and relay station. The information on which the Hydrographic Office based its reports is so meager, however, that the department has concluded to await the result

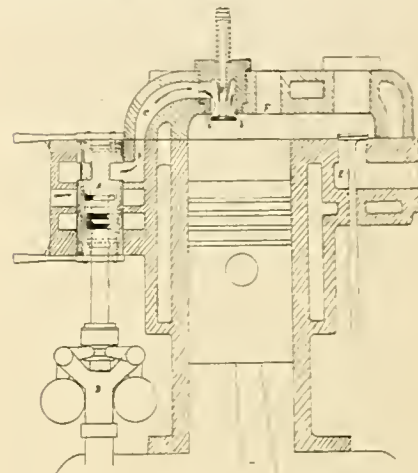


Fig. 2.

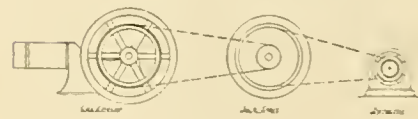


Fig. 3.

of surveys to be made. The gunboat Bennington started recently from Honolulu for Manila, with orders to stop at Wake Island and leave there a notice that the island was a possession of the United States. One of the naval colliers, the Nero, is now being fitted up for making deep-sea soundings in the Pacific to ascertain feasible cable routes.

Being practically convinced, however, that the reports of the Hydrographic Office will be verified, the officials are considering three other routes from San Francisco to Manila. All of these contemplate the Hawaiian Islands as the first landing place. One of the routes is from Honolulu to Johnston Island, thence to Guam, and thence to Manila. Johnston Island is detached from the Hawaiian group, but has been considered as a geographical part of it. A few years ago it was visited by a British gunboat, which proclaimed it a British possession. No apprehension that this will prevent the use of the island for a cable landing station is felt here.

Another route is from Honolulu to Midway Island, northwest of Hawaii and not quite half the distance between Hawaii and Guam, thence to Guam, and from Guam to Manila. Midway Island is one of the detached dots on the map of the Pacific. The third route is from Honolulu to Marcus Island, thence to Yokohama, and from Yokohama to Manila, Guam being taken in by a loop connecting Manila with Marcus Island. By adopting this route it is believed that a great deal of private business would be secured. Marcus Island is another detached formation. It stands sixty feet above the water, is in no danger of submersion, and contains trees and plants, thus making it a not undesirable place of residence for the cable operators. It is situated to the northeast of Guam and about 1,200 miles southeast of Yokohama. Geographically it is not attached to any particular group. Its nearest neighbor is Marshall Island, to the south, which must not be conflicted with the Marshall group, far to the southeast.

Advices from England indicate that the preparations of the British government are not as far advanced as those of the American government. In

the House of Commons recently Mr. Hogan asked the secretary of state for the colonies whether any decision had yet been arrived at by the imperial government, in co-operation with the governments of Canada, Australia and New Zealand, in reference to the construction of a Pacific cable, having regard to recent important international developments in that ocean. Mr. Chamberlain replied that no decision has yet been arrived at.

Storage Batteries and Railway Power Stations.

By ROBERT McA. LLOYD.

PART II.

In regard to the "small" battery, there is no doubt of its advantages in many cases, but for new installations it is not always the most economical battery. I understand that Mr. Leslie Carter, the president of the South Side Elevated Railroad company in Chicago, said recently that, as far as he knew, their battery did not save anything in the cost of operating the road, but that they could not run without it, and I take the liberty of making the following extract from his annual report to the stockholders, which has since been published:

STORAGE BATTERIES.

While the amount of current used per car-mile is low, and has produced gratifying results in all tests and comparisons made, the fluctuations of power above the average requirements are large, and the sudden demands on the power house compelled us to prepare promptly for the heavier business of the winter, which, with increased number of cars in service, heat and light loads, would have been beyond the capacity of the power house. Additional engine capacity could not be obtained in the time at our disposal, would have cost more money and have been expensive to operate. We accordingly installed two batteries of 750 kilowatts each, equidistant from the power house, at Twelfth and Sixty-first streets respectively. These batteries have greatly reduced the fluctuations and the maximum load at the power house. While the output at the power house is the same, the batteries charge at times of light traffic and discharge at times of heavy traffic, thus equalizing the work at the power house, and relieving the engines and generators. This is certainly an economy, and it is further claimed, with what correctness I am not yet convinced, that they cheapen the cost of production. But I do know that they keep up the voltage at the ends of the line, enable your road to operate more cars, furnish increased facilities to patrons, and prevent damage to power house machinery in case of sudden demand for increased power.

That battery was, of course, put in for regulating purposes only, and the load curves, some of which are shown in the following figures, give one the impression that the battery must certainly be useful. It seems to me hardly worth while in laying out a new station to put in a battery for the purpose of reducing the railway-power curve to the characteristics of electric-light practice, when by going a few steps further it may be refined to a practice comparable with marine engineering.

It might appear at first thought that a battery of sufficient capacity to insure a full load for the generating units at all times would save as much fuel as a battery large enough to level off the 24-hour service, but it is very difficult to follow the power requirements from hour to hour in such a way as to make ideal use of a battery, whereas, with a "large" battery, it would be possible for the ordinary station engineer to adjust his load so as to operate all of his apparatus to the best advantage all the time.

I have carefully analyzed the figures in Mr. Conant's very interesting paper, before referred to, and am compelled to differ from him at some points, and refer to them in order to meet in advance any criticism of my paper which may be based on his tables. In the first place, he assumes that his standard station can be worked all the year round with a load factor of 33 1/3 per cent., which is entirely too high; 20 per cent. or 25 per cent. would be more normal. I suspect that Mr. Conant's load factors have been obtained by indicator cards, instead of wattmeters. In Mr. Conant's table none of the stations shows a better figure for coal than three pounds per kilowatt-hour, while his standard station is put down for 2.2 pounds, without any intimation of the process for attaining such a good result. The question as to how the cost of repairs and depreciation of the entire plant would be affected by a large battery is particularly debatable ground. Mr. Conant allows two per cent. for depreciation beyond the normal running repairs. He estimates the entire plant including buildings, to last 50 years. His statement that the machinery now being installed will last much longer than that with which we have been familiar in the last decade has nothing to back it up except faith in the promises of the builders.

I propose to allow 10 per cent. per annum for repairs and depreciation on the entire station apparatus, including batteries. I have not seen any boilers that are likely to last 50 years, and there is plenty of evidence that all the best engines and boilers in this class of service to-day will go to pieces in a life of from 10 to 20 years. The particularly hard usage to which most of them are subject is not only steadily wearing them out, but producing a state of constant danger and not infrequent accidents. I am sure this is becoming well understood among railway men, and some of the best managers are writing off to depreciation 10 per cent. per annum. Moreover, who can say that improvements will not be made in the next 10 years, as in the past, and that engines and boiler may not be out of date before they are used up?

It is of course well known that whatever the rate of depreciation may be without batteries, it will be lowered by giving the generating apparatus a constant load, say half load, therefore, that the storage battery will not increase the rate of deprecia-

tion for the entire plant. If it can be shown that interest and depreciation for a plant of given load dimensions are practically equal, with or without a large battery, it is evident that the great saving in fuel alone will determine the superiority of the battery system.

I have so far considered the battery only at the central generating station, so that all the advantages due to locating it at proper points in the distribution system are additional arguments in its favor. In many cases the saving in copper may be greater than the sum invested in the battery, and the flexibility of the system improved in places where it would not pay to install sufficient copper to meet the irregular demands of travel.

The reserve qualities of the storage battery are unique. It might be supposed that a mere reservoir which is quickly drained would be of little value compared to a lot of extra generating apparatus standing idle, but experience is demonstrating every day, in existing plants, that the reserve which is needed most is the reserve which is not only ready for emergencies, but actually alive to any demand without the direction of a human mind.

Most of what has been said of the storage battery, as applied to the power station illustrated by

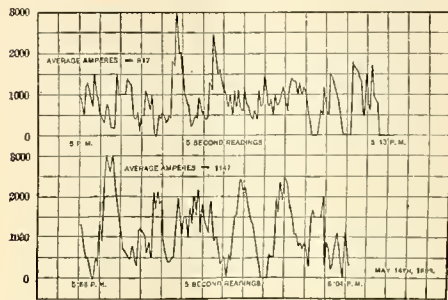


FIG. 3. Curves showing fluctuation of load, May 2, 1898, at power station of South Side Elevated Railroad company, Chicago, Ill.

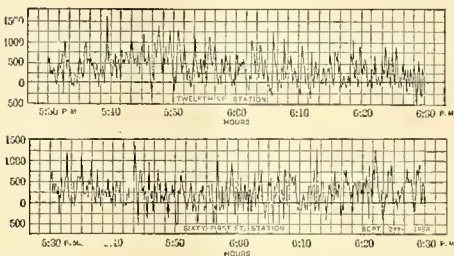


FIG. 9. Curves showing regulating effects of batteries at the Twelfth street and Sixty-first street stations of the South Side Elevated Railroad company, Chicago, September 20, 1898.

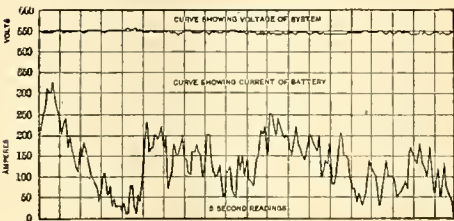


FIG. 6. Tests made at the Woonsocket Electric Machine and Power company. Battery carries the whole load of station.

STORAGE BATTERIES AND RAILWAY POWER STATIONS.

the curves in Fig. 1, is true of its application to railway-power stations in general. The use of water power introduces a factor in the problem more variable than fuel, and I shall not attempt the discussion of it. Alternating currents lend themselves readily to the development of storage-battery applications on account of the mutually helpful combination of battery and rotary at sub-stations. Up to the present time, each of the large batteries installed for railway work has been obliged to meet different conditions and requirements, but they are all serving their respective purposes well, and showing many different fields of usefulness. I shall not refer to these plants, because Mr. Appleton, in a recent lecture to the New York Electrical society, has ably described those of most importance.

Most of us feel that the electric railway and electric-lighting interests are destined to get into closer relations, and the generating station of the future may be required to furnish all the electricity used within large areas for every purpose.

Coming, finally, to a problem which has been the subject of some newspaper discussion of late, I trust you will pardon me for treating of work with which I have no connection. Electricity has so many advantages over any other medium for transmission and storage of energy that I assume its use to be firmly established, and cannot conceive of any lasting rivalry by the other contestants now in the same field. Further than this, without saying anything for or against monopolies, I believe that all the energy supplied by means of electric currents to consumers of every nature in the Greater New York

should radiate from two or three central stations, and that these should be electrically tied together. The sub-stations would naturally consist of rotaries and storage batteries. It may not be possible to lay out each sub-station, so that the rotaries would run at a constant load for 24 hours a day, but it seems to me quite probable that such an arrangement would eventually be reached, and this would, of course, give the generating stations a constant load.

At the present time the load curves of the electric railways are very uncertain, and peaks are likely to occur at almost any time of day, while the addition of the peak due to electric lighting in the early evening would not add in large proportion to the railway peak, but electric lighting is capable of more general application, and it is possible that within a few years the distribution in the borough of Manhattan may reach from three to five hundred thousand kilowatts at the highest part of the lighting curve, which will probably be as great as the railway load when the elevated railway and the underground rapid transit are included. These peaks will often occur at the same time of day, and so there is no possibility of improving the load factor of either system by splicing the two together. It follows, therefore, that what is true of the relation

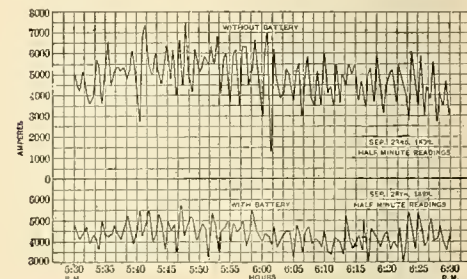


FIG. 8. Curves showing generator load at the power station of the South Side Elevated Railroad company, Chicago, Ill.

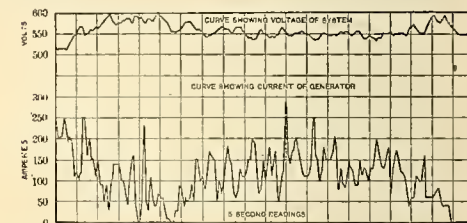


FIG. 5. Tests made at the Woonsocket Electric Machine and Power company. Generator carries the whole load of station. Rather regulation.

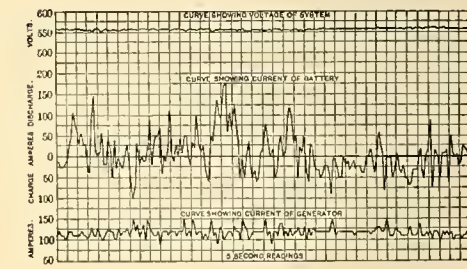


FIG. 7. Test made at the Woonsocket Electric Machine and Power company. Generator and battery in operation.

of a storage battery to the economy of the generating station for power or light separately will be true of the resultant of their combination.

The railway and light people recognize the importance of leveling up some portions of their load curves, but I estimate that the greatest saving is to be obtained by operating for a constant load 24 hours per day. However high would be the economy of such large stations, I am sure it would be higher with large batteries than without. Certainly the economy of the Boston pumping station as to fuel consumption should be surpassed. It must not be assumed that a high load factor for the system is an advantage. It is all right for the generating plant and for the copper feeders, but the kilowatt-hours that bring in the most money may spoil the looks of the load diagrams and kill the load factor. What is required to earn dividends is a profitable load factor outside of the stations, whether high or low, and the highest possible load factor at the dynamo terminals. The large storage battery meets these two requirements perfectly. A load factor of 100 per cent. may be maintained at the dynamo and current may be sold to the consumer regardless of the time of day.

With a million kilowatts in view for the borough of Manhattan, it would be necessary to generate an approximately constant force of 300,000 kilowatts.

A million kilowatts in station plant, without the battery factor, would cost \$100,000,000.

The same capacity, including the proportion of battery now deemed advantageous by some of the engineers in touch with these problems, would be di-

vided as to cost into \$70,000,000 of generating plant and \$30,000,000 of battery plant.

Finally, the same capacity, if divided in the proportions which seem to me most productive for the investment, would cost \$30,000,000 in generating plant and \$70,000,000 in battery.

This is quite a large battery plant, and as there would be more than two parts battery to one part generator, I am fearful of the jealousy which such a reversal of engineering practice would create.

In conclusion, I wish to state that nothing in this paper should be regarded as emanating, officially or unofficially, from the company with which I am connected.

The accompanying diagrams, Figs. 3 to 9, inclusive, show railway power curves, with and without batteries. If they do not indicate attainment of perfect results by the battery, it is not because perfect regulation is impossible, but because the engineer is well pleased with what he has, and does not strive for greater refinement. Fig. 2 shows the application of storage batteries to a large railway installation, in which part of the power is generated at a waterfall. It shows what may be done by what I have called a "medium" battery.

British Admiral in Electric Cab.

A New York correspondent relates the following incident of Rear-Admiral Beresford's visit to the

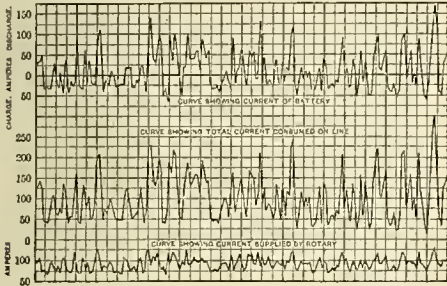


Fig. 4. Curves showing Regulating Effect of Storage Battery at Power Plant of the Barre-Montpelier Traction Company.

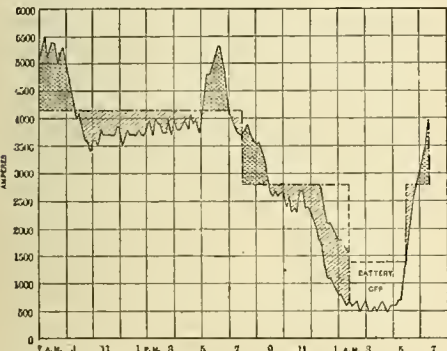


Fig. 2. Storage Battery on Large Railway Installation. STORAGE BATTERIES AND RAILWAY POWER STATIONS.

Brooklyn navy yard during the distinguished Irishman's sojourn in New York.

"When Lord Charles Beresford returns to England he will be equipped with material for a rattling good story about how he fooled the alert marines at the Brooklyn navy yard, with the assistance of an electric cab. It was thoroughly enjoyed by the distinguished Englishman.

"Lord Charles had an engagement to visit the navy yard, and Commodore Philip telephoned instructions to the Sands street gate to admit Lord Charles and his carriage without question. He ordered, further, that the marines on duty at the gate should line up and stand at attention as the rear-admiral of the English navy rode in.

"The marines burnished their buttons and their guns, put on extra polishes on their shoes, and prepared to make a front that would dazzle Lord Charles Beresford or anybody else.

"Down through the mud puddles of Sands street came bowling along a common-looking horseless cab. The sharp-eyed sentry had been expecting that so distinguished a personage as Lord Charles Beresford would doubtless come over in a coach and four, preceded by a brass band and an escort of police, so he paid no attention whatever to the auto-cab, which audaciously switched around, ran through the gate, and was several yards into the grounds before the sergeant of marines ran out and stopped it.

"The man on the cab was asked where he was going. He said to the house of Commodore Philip. He was then asked why he was going, who sent him, what his business was, why he came on Sunday.

"Back up," ordered the sergeant of marines. "There's never been a horseless carriage in this navy yard and there won't be while I'm here."

"So the man on the cab, with no small display of profanity, backed up to the gate and was maneuver-

ing to back out the gate when a large, good-natured face protruded from the cab window.

"I guess you don't know me," said the owner of the face, smiling; "I'm Beresford."

"The sergeant of marines retained presence of mind enough to refrain from fainting, the guard poured out and stood at attention, and the triumphant man on the cab steered his buzzing vehicle into the yard, where Commodore Philip met his guest."

Thawing Ice in Buried Pipes by Electric Heat.

The exceptionally cold weather of the greater part of February all over the northern portion of the United States, east of the Rocky Mountains, caused the freezing of the water in the buried service pipes leading from street mains to house in numberless instances. The usual method of plumbers in thawing out the pipes is tedious and expensive, costing anywhere from \$25 to \$150, while—in Chicago, at any rate—a deposit of money has to be made at the city hall to insure the proper restoration of the pavement if an excavation in the street is necessary. The plumber's assistant first thaws the frozen ground by building a fire of wood or coke, and a hole is dug to the pipe. Sometimes the ground is frozen so hard and so deep that after an opening has been made in the ground a second fire in the hole is necessary to soften the ground farther. When the service pipe is uncovered it is cut from the main and low-pressure steam, or sometimes hot water, from generators or heaters on the street is forced or pumped into it, and gradually the ice in the small pipe is thawed. This method is effective for a distance of about 15 feet, and it is often necessary to dig several holes, either because the service pipe is a long one, or because the frozen section was not encountered in the first instance.

Several persons have used electricity as an improved method of thawing the ice in buried water pipes, but Mr. Francis H. Soden, an electrical engineer of Chicago, claims to have been the first to give practical demonstration of the success of the new system. Mr. Soden has used electricity for this purpose in several instances and always with success. The diagram given herewith shows the essential features of his method. Excavating streets or the grounds outside of buildings is not necessary.

The operation consists in uncovering the service pipe after entering the basement of a building and cutting the pipe in two, so that electrically the water-pipe system of building is cut out of circuit; thus there is no danger of leakage of electric current to the numerous pipes and conductors usually about buildings. Alternating current has been employed. One wire of the secondary main of a transformer is connected to the end of the pipe to be thawed where it is exposed indoors, and the other wire is connected to any convenient point of the water-pipe system that is exposed on the street, such as a fire hydrant or the next building's street-hose attachment, or in the next building to the nearest faucet. The current should be regulated to a safe carrying capacity of the pipe's least conductive point. The service pipe, if of the same carrying capacity throughout, will be uniformly heated. The primary of the transformer should be equipped with a reactive coil so that the current can be regulated to suit the conditions of the secondary circuit.

The current should heat the lead pipe so that it is perceptibly warm to the hand; approximately 50 degrees Fahr. is sufficient, while 100 degrees Fahr. will not be injurious, and the work will be hastened. Care should be taken in operating not to heat to the fusing point of the metal, especially on lead pipe, which fuses at 617 degrees Fahr.

As the ice becomes sufficiently loosened the water from the main, being under pressure, forces a passage between the ice and the pipe and helps to clear its own way.

Mr. Soden says that there is no injurious effect causing electrolysis, as if single-phase high-frequency alternating current is used such effect is practically nil; and in any case the current is not in use a sufficient length of time to cause appreciable effect, especially as the ground surrounding the pipe is frozen and is consequently a poor conductor of electricity.

The current naturally follows the path of least resistance. In this case the path is metallic, and the current will practically return all its power in useful work. The power needed will vary slightly in somewhat similar cases, according generally to the amount of ice contained in the pipe.

Two cases in which Mr. Soden's plan was used are of particular interest. One was that of St. James Methodist Episcopal church, on February 18th. Here there were 80 feet of one-inch lead pipe, 45 feet of six-inch iron pipe and 30 feet of one-inch lead pipe in series with a copper wire of .01 ohm resistance to make the circuit through which passed a current of 155 amperes at 25 volts, or 3,775 watts. The water began to flow in seven minutes, with a full head of water at 12 minutes.

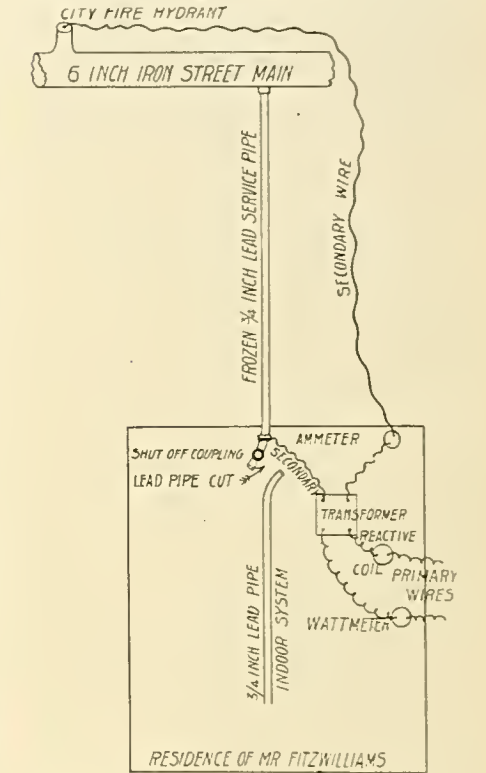
At the residence of Mr. Fitz Williams, 3824 Vincennes avenue, the circuit consisted of 85 feet of 3/4-inch lead pipe and 22 feet of six-inch iron pipe, with a copper wire of .02 ohm in series, through which flowed a current of 100 amperes at 30 volts, or 5,700 watts. Here the water started to flow in 12 minutes, and there was a full head of water in 30 minutes

The pipe here showed more ice than at the church. If necessary the time between the starting of the water and the resumption of full pressure could have been shortened.

The apparatus used in both cases was a laboratory transformer connected to the 125 cycle 1,100 volt alternating lighting mains of the Commonwealth Electric company of Chicago. The transformer was equipped with a reactive coil in series with the primary circuit. The secondary coil was so wound that by changing connections at terminals of windings either five volts or multiples of five volts up to 50 volts could be secured, independent of reactive coil regulation, so that large amperage was possible with this apparatus at small voltage. Fine regulation could be had by the use of the reactive coil when desired.

Mr. Soden has been 29 years in the electrical profession, having been connected with Mr. Edison's laboratory in Menlo Park, in 1879, and the early Edison electric lighting in New York. He was the first electrical engineer to install wires for Edison lamps in Chicago when business opened here. Mr. Soden has lately obtained valuable patents on the purification of refractory ores as found in nature.

Reports from other places indicate that the plan of electrically thawing the ice in buried water pipes



THAWING ICE IN BURIED PIPES BY ELECTRIC HEAT.

was adopted elsewhere with success. Prof. R. W. Wood and Prof. D. C. Jackson of the University of Wisconsin at Madison, Wis., appear to have accomplished the same result as Mr. Soden in Chicago without knowing of his work, for one newspaper dispatch credits Professor Wood with the statement that so far as he knew the idea was wholly original with him. The method seems to be much the same as that of Mr. Soden, except that a somewhat higher voltage was used, and no mention is made of cutting off the house piping.

Successful tests were also made in Beloit, Wis., and Des Moines, Iowa, the latter by E. G. Pratt, manager of the Capital City Electric Light company. An amusing instance was reported from Plymouth, Ind. An Associated Press dispatch from that place says: "Hardly had the heavy arc wires been connected with the mains and a circuit established, when every telephone bell in town began to ring. Most of the ground connections to the telephone system are made by attaching the wire to water pipes. The mains could soon be thawed if the people could stand the noise of the bell-ringing."

J. M. Johnson, in a letter to the *Chicago Record*, gives a note of warning. He says: "I have used electricity for several years to thaw frozen pipes and heat water passing through the same for warm-water purposes. This system is not practicable, as electrolysis takes place and is liable to destroy all the pipe in the circuit. When the water liberates the hydrogen which unites with the carbonic oxide of the iron the temperature rises and condensation takes place in the electric current and unites with the hydrogen and oxide, thereby forming sulphuro-pholena. This will dissolve iron very quickly. I have a sample of pipe ruined in about forty minutes that was over 200 feet long and 1 1/2 inches in diameter." Mr. Johnson's phraseology and reasoning are not very clear, and Mr. Soden, as stated above, thinks that the danger from electrolysis is not great.



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DEPARTMENTS.

Table listing departments with page numbers, including 'Correspondence', 'Electric Lighting', 'Electric Railways', etc.

American electrical manufacturers who are seeking a market abroad will have plenty of opportunities during the next two years, through the Paris and Pan-American expositions, to show their products to foreign buyers in the most advantageous manner.

In the case of the Paris Exposition, American manufacturers will place their apparatus in direct competition with that made abroad, and those who are familiar with both classes, have no fear that the reputation of Americans will suffer by this comparison.

upon a building, and the architects, George B. Post of New York and Mr. Coolidge of Chicago, are now conferring with Mr. Peck and the supervising architect about the plans.

In this connection it is interesting to note that the American Chamber of Commerce of Paris, an organization formed for the purpose of facilitating commercial intercourse between France and the United States, and protecting and promoting the interests of those engaged therein, which embraces among its membership nearly all the important houses established in Paris or represented there which are engaged in such commerce, has strongly urged upon Congress the necessity of a liberal appropriation for the American section of the Paris Exposition.

In spite of the vigorous protests of the electrical interests of the country, the Navy Department has seen fit to take a step backward in the matter of mechanical equipment for its new vessels. The further use of electricity on warships for certain purposes for which steam may be employed is to be abandoned in accordance with an opinion of the assistant secretary of the navy, to whom the question was referred when the naval board of bureau chiefs was unable to decide the matter satisfactorily.

The question which Mr. Allen has decided was raised two months ago, when the power that should be used on boat cranes, winches on deck and other auxiliaries on the five new battleships was being considered. The effect of his decision will be to go back to steam power for auxiliaries where electricity has been generally used.

Lord Beresford, the British admiral who has been visiting this country, pronounces unqualifiedly in favor of electric cabs and declares his intention of never again riding behind a horse when he can procure an electric vehicle; at least, that is what he is reported as saying in New York by the enterprising reporters who accompanied him in his trips about the city.

ference of opinion as to the best practice. The manager of the London Electrical Cab company contends that the experience of that corporation sustains the claim he has made in favor of heavier carriages than are now being introduced.

I note it is stated that the "new motors weigh 16 hundredweight, whereas an electric cab weighs two tons." The writer of the article has evidently been misinformed, as the weight of the London electrical cabs does not exceed 3,200 pounds complete, and they are supplied with power sufficient to propel the cab 40 miles with each charge of the accumulators, at a speed of about nine miles per hour.

The tendency toward reducing the weight of these conveyances should not be developed to the extent of sacrificing strength and durability of carriage or the driving mechanism, but there is no doubt that experience will indicate changes in design and construction of the old carriages that will effect a marked improvement in them and at the same time bring about the desired reduction in weight.

Some things there are that are done better in the United States than in England beyond question or cavil. And one of these is the making of proper compensation for electrical engineers in municipal employment.

It is true that the remuneration of the electrical engineers formed the topic of a rather heated discussion at a late meeting of the vestry. While the salary of the chief electrical engineer, Mr. George H. Cottam, was increased from £450 to £550 practically unanimously, the recommendation of the committee that that of the three assistant engineers should be augmented met with much opposition.

An Open Discussion on "The Electrical Business."

The Young Men's Christian Association Electrical Club is composed of about sixty young men who are anxious to make a success in electrical work. This club has been organized for two years and now owns considerable laboratory equipment and conducts four classes in connection with the Association college. At the last regular meeting of the club on February 24th, in the association parlors, about 150 young men were present, and the programme was an open discussion on "The Electrical Business—Does it Pay and Where Are the Chances?"

One of the features of the evening was the reading by George A. Damon, the director of the club, of a paper which was a symposium of the answers to a circular letter which had been sent to a large number of men prominent in several electrical lines. In this letter the question was asked what opportunities the business offered, and what salaries were paid, what were the qualifications necessary to both a start and success; whether the business or the technical end was paid better and the benefit of a college education.

It was generally conceded that the newest developments offered the largest opportunities. These were variously indicated as water-power development, alternating-current transmission, storage-battery work, electric interurban railway construction, electro-metallurgy, automobile work and the application of electricity to steam lines. Patent law and the rapidly growing telephone field were also advocated.

It was quite unanimously agreed that the business end paid better than the strictly technical branches, though the value of a combination of business and technical training was brought out.

The salaries connected with a large variety of occupations were given in connection with considerable information in regard to the relative chances for advancement in each line.

Following the reading of the paper, Mr. H. H. Cutler, general manager of the Cutler-Hammer Manufacturing company, answered the question of "How Should a Young Man Get a Start in Electrical Work?" Mr. Cutler, referring to his own experience as a boy, told how he had tried to learn chemistry, because it was his father's business; how he had tried architecture because his mother thought it would be nice, and how finally he went to work in a machine shop for 8½ cents an hour, because of his own inclination to "make things." His start in the electrical business was secured by a careful study of the electrical exhibit of the Franklin Institute in 1884, after which he applied for a position with one of the electrical manufacturers, and went to work for \$1 per day. Mr. Cutler pointed out that the secret in getting a good job was to pick out a class of useful work which you liked, learn to excel in that one particular line, find a man who could use your peculiar abilities and impress him with your desire to work for him. "Learn to excel in some one particular, useful work and you'll never have any trouble to find and hold a job."

City Electrician Edward B. Ellicott spoke of "The Chances in the Municipal Electrical Service," and brought out the fact that of 170 men employed in the electrical department of the city of Chicago, not one was a college graduate. There were three divisions in his department—electric lighting, fire-alarm telegraph and inspection. The best chances for obtaining a start were in the lighting department, as a man could begin at the bottom and work up, learning all the details as he advanced. He instanced a case where a man had worked up from \$40 to \$75 per month within a year. The fire-alarm service required men of peculiar ability and long experience, and was a hard department to get into. The inspection department contained the best class of young men, and for this department his experience had been that practical electricians passed better examinations than young college graduates. Every position in the city electrical service, except those of the heads of departments, was under the civil-service law, and Mr. Ellicott was sure that the examinations made it possible for every applicant to be judged on his merits without political influence entering into the selection. He deplored the fact that a higher grade of applicants did not take the examinations, and believed that there were first-class chances in the city service for bright young technical graduates with a year or so of practical experience.

Mr. Bion J. Arnold spoke of the "Qualifications for Success." The chief requisites, he said, were a high ideal, a firm determination to succeed and a strong will. It was absolutely essential for a young man to aim high and after setting a mark to be determined to accomplish his purpose. He should develop the quality of decision and know how to say "yes" to the right thing and "no" to the wrong thing, and he should always keep his reputation clean and free from compromising decisions. He told the story of a boy whom he had employed at one time, who "didn't want to make blue-prints, but wanted to become a consulting electrical engineer at once," and brought out forcibly the point that a young man should not expect success too soon, but should make progress slowly and surely. A young man should start with the purpose not so much to make money at the beginning, but to secure a broad ground-work of knowledge and a working proficiency in his chosen vocation, and a reasonable compensation would surely come in time. He had learned that a great many men could stand success, but that few could stand

defeat. It was when a man was down that his best efforts were called for. If a young man can get out of difficulties by his own efforts he is sure of success. He believed that it was true that "genius was nothing but the ability for hard work."

Mr. Scheible of the Cutter company spoke briefly of the chances in the supply business, and showed that the successful manufacturer was the one who made goods not only "to sell, but to excel."

Mr. H. A. Seward of the Edison company, the president of the club, brought out the point that a young man should be loyal to his employer. He told the story of a young man who, after working for four years for \$7 per week, demanded more pay. When his employer told him he wasn't worth any more, he replied, "Well, you just give me more money and I'll show you I can earn it. I can work just as hard as any man in the shop, if I only get paid for it." The moral was apparent.

Mr. Floyd Marshall of the *Street Railway Review*, who was chairman of the evening, closed the discussion by giving some statistics showing the vast investments in electrical enterprises, and pointed out the chances for technical men by quoting the figures recently gathered by Prof. Goldsborough, which showed that after five years' experience the salary of the Purdue graduates averaged \$1,500 per year.

Death of John Kruesi.

John Kruesi, the chief mechanical engineer of the General Electric company, died on February 22d, at his home in Schenectady. His death, which resulted from an attack of grip, occurred quite suddenly, after an illness of only three or four days.

The funeral services, which were held on Saturday, February 25th, were attended by thousands of the



JOHN KRUESI

officials and employees of the General Electric company and of his neighbors in Schenectady. Many of Mr. Kruesi's old associates in the early Edison days were present as a last mark of respect to their old friend and comrade.

Among those who came especially from long distances were Thomas A. Edison; C. A. Coffin, president of the General Electric company; Samuel Insull, president of the Chicago Edison company; F. P. Fish, general counsel of the General Electric company; Charles A. Batchelor of New York city; S. Bergmann of New York city; J. W. Lieb, general manager of the Edison Illuminating company of New York; John Langton of New York city; W. S. Barstow, general manager of the Edison Illuminating company of Brooklyn; F. R. Upton of New Jersey; Wilson Howell of Harrison, N. J.; Martin Insull of Chicago; W. E. Gilmore of Orange, N. J.; C. T. Hughes, manager of the New York office of General Electric company, and many others.

The pall-bearers were A. G. Pitkins, vice-president of the Schenectady Locomotive Works; John De Remer of Schenectady; E. W. Rice, third vice-president of the General Electric company; G. E. Emmons, general manager of the General Electric company; Charles A. Batchelor and Samuel Insull.

John Kruesi was born in Spercher, Canton Appenzel, Switzerland, in 1843, and went to work in a machine shop at an early age. He found his way to Paris in 1867, the year of the exposition, and remained there, working in various mechanical industries until the outbreak of the Franco-German war in 1870. He then went to London, where he remained until he finally resolved to make his home in the United States, which he reached in December, 1870.

An old acquaintance and fellow-countryman, August Weber, whom he had met at the Paris Exposition, was then working for the Singer Sewing Machine company at Elizabeth, N. J., and it was with the same company that Mr. Kruesi first found employment in this country. During the two years that he stayed in Elizabeth he showed that he had a firm grasp of mechanical problems, and in 1872 he was given full charge of a new automatic machine for making needles.

At this time Mr. Thomas A. Edison, in partner-

ship with Mr. Unger, was manufacturing stock exchange tickers and telegraph instruments, in Ward street, Newark, and in June, 1872, Mr. Kruesi began to work for him. The panic of 1873 seriously disturbed Mr. Edison's plans, and he and his employees found it hard work at times to make a living between 1873 and 1875, but in the latter year Mr. Edison felt strong enough financially to open a second shop for purely experimental work in Green street, Newark. One of the first men whose services he was able to utilize in this field was John Kruesi, and for the next five or six years, either in the Green street shop or at Menlo Park, Mr. Kruesi was practically Mr. Edison's machine foreman, not only designing and making special apparatus to fit the conditions which Mr. Edison required, but also often making the special tools necessary for newly invented apparatus.

During this five years—from 1876 to 1881—Mr. Edison was busy with the phonograph, improvements on the Bell telephone, incandescent electric lighting, electric-railway experiments, and, above all, the subdivision of the electric current necessary to make incandescent lighting successful as a commercial venture. During this period Mr. Edison's power of doing without sleep and of working day and night for several days in succession tried the endurance of the strongest of his associates. Mr. Charles A. Batchelor, who was closely connected with Mr. Edison at this time, says that of all the group of men who worked at Menlo Park Mr. Kruesi was the most tireless, as well as being one of the most fertile in suggestions to overcome the difficult obstacles to success which were constantly arising. The first phonograph ever constructed was made by Mr. Kruesi from Mr. Edison's rough sketch, and this instrument is now in the Patent Department of the South Kensington Museum at London.

In 1881 incandescent electric lighting had passed beyond the stage of experiment, and the Electrical Tube company was formed, with Mr. Edison as president, Mr. Samuel Insull as secretary and Mr. Kruesi as treasurer and general manager, to make and lay down underground electric conduits in New York city and elsewhere. The first shops of this company were in Washington street, New York, and there Mr. Kruesi, often with his own hands, turned out the early conduits which were laid down in the lower part of New York city—the first two-wire conduits for lighting or power to be placed in service in any part of the world. Nearly all the early patents for improvements in underground conduits bear Mr. Kruesi's name as inventor.

The Electrical Tube company, after moving its shops to Bridge street, Brooklyn, for a short time, was finally absorbed by the Edison Machine Works, whose shops were then in Goerck street, New York, in 1883. Mr. Charles A. Batchelor was then general manager of these works, and Mr. Kruesi became his assistant. In 1886 the Edison Machine Works were removed to Schenectady, Mr. Samuel Insull becoming the general manager and Mr. Kruesi retaining his place as assistant general manager. Mr. Insull himself gives Mr. Kruesi credit for having designed and constructed all the shops which were erected while he was general manager—that is, from 1886 to 1892. "When we went to Schenectady," said Mr. Insull, "we had only 200 employees, and in 1892, when the General Electric company was formed by the union of the Edison and Thomson-Houston companies, we had 4,000 employees, so that Mr. Kruesi had to make provision for this large increase in the comparatively short space of six years." In fact, the works, as they now stand, are Mr. Kruesi's monument.

In 1892 Mr. Kruesi succeeded Mr. Insull as general manager, and in this capacity had charge of the Schenectady works until 1896, when he was appointed chief mechanical engineer to the company. During his long connection with Mr. Edison and the various companies which were his successors, Mr. Kruesi made many important improvements and inventions in machine tools. He was also, from his thorough understanding of the strong and weak points of apparatus, a salesman of more than average ability, when his services were wanted in this capacity. He had a large and varied electrical knowledge, particularly in his keen recollection of numerous experiments which had turned out failures, and of the reason why success along some particular line could not be achieved. Most of all he was prized for the absolute honesty of every side of his character.

Mr. Kruesi was a regular attendant at the meetings of the Association of Edison Illuminating Companies, and his advice was always received with respectful consideration. While attending the last convention a snap-shot photograph from which the accompanying portrait is made was secured by Mr. King, the mechanical engineer of the Chicago Edison company, and it is needless to say that he prizes it highly.

Mr. Kruesi was a widower, his wife having died in January, 1897. He leaves a family of eight children, the eldest of whom is now in England.

The will was read after the funeral, and it was found that the executors were Mr. Thomas A. Edison, Mr. Samuel Insull and Mr. Charles A. Batchelor.

A local telephone system is to be installed at Fremont, Ia.

DEVELOPMENT OF THE TELEPHONE FIELD.

Michigan Telephone War.

[From the Detroit correspondent of the WESTERN ELECTRICIAN.]

A meeting was held recently in Lansing by those who are interested in the independent telephone movement in this state. There were representatives from the independent exchanges of Detroit, Grand Rapids, Kalamazoo, Battle Creek, Lansing and other cities. The meeting was not open to the public, and the only news given out for publication was the fact that a concerted movement among the independent telephone companies to fight the Bell interests will soon be under way. One of the important subjects under consideration was the regulation of tariff rates on the state lines. These, it is believed, will be somewhat lowered and made more uniform. They will be regulated according to distance and the time used.

The men who were present admitted that most of the afternoon and evening was taken up in discussing the new rates made by the Michigan Telephone company. They declare that the intelligence of the public would not permit the independent companies to be driven out of the field, as the Bell interests would immediately raise rates to the old scale.

Said an officer of the Detroit Telephone company: "We are in a peculiar position in Detroit, as well as in other places. For instance, in Detroit, our franchise expressly stipulates that we cannot charge more than \$25 for residence telephones and \$40 for business places. Naturally, we have the right to lower, but not to raise them.

"Now if the Bell company manages (I don't think they can) to drive our companies out of the state, it will be able to raise its prices and thus recoup itself.

"And then, again, we have our investment to look after. Last year we paid six per cent. clear to our stockholders. We cannot afford to go into a rate war which might in the end wipe out not only the interest but the principal as well.

"The Bell company offers to make 10-year contracts for its telephones at \$24 and \$36 per year. To explain how they do this I will tell you something of our own experience.

"When the Detroit Telephone company was first in good running order there was a continual buzzing sound on the wire. We had some expert electricians in our employ, and they said it was caused by electric-light wires falling across our wires. After two weeks of tracing it was discovered in an alley under the eaves of a barn. We had it fixed immediately and the buzzing stopped. We have had trouble since then, and the same electric-lighting company has always been to blame.

"Wouldn't it be an easy matter to have one of those wires interfere with the operation of the cheap-rate Bell instruments? And wouldn't it be easy for an agent of the company to say, 'Well, that is the best we can give you on this contract. If you pay, say, \$75 a year for one of our new long-distance telephones, the buzzing will cease.' And with a poor telephone on his hands, and only one company to deal with, the subscriber would have to cancel his old contract and put in a new instrument.

"But I have always said that we must rely on the intelligence of the public. We are giving a first-class service; we are adding improvements in equipment and methods of operating, and we believe the public, because they form the majority of our stockholders, will stay with us."

Independent Interests in Baltimore.

By a decree of the Circuit Court at Baltimore, February 20th, the property and franchises of the Home Telegraph and Telephone company were sold at auction for \$175,000. The purchase includes a thoroughly equipped central telephone office and upward of 1,200 subscribers. The franchise of the company was granted in 1892 by the state Legislature, and included the privilege of using the city's conduits. The property will at once be reorganized.

The syndicate which recently bought up the street and suburban railway lines and the electric-lighting and power companies is negotiating for the purchase of the Home Telephone plant, with a view to consolidating the telephone and electric-light companies and amalgamating them with the United Railways company.

The representatives of the United Railways company are said to have proposed to exchange one share of that company's stock, the par value of which is \$50, for four shares of stock of the Home Telephone company, the par value of which is \$20. This is equivalent to \$125.00 a share for Home Telephone stock. There are 5,000 shares of Home Telephone stock, aggregating \$100,000, and the total purchase price would be \$62,500 in the common stock of the United Railways and Electric company. The total issue of United Railways common stock is \$24,000,000, of which \$2,000,000 will be issued this month and distributed among the subscribers to the underwriting syndicate in the shape of a bonus of 25 per cent. upon their subscriptions for the bonds and cumulative preferred stock. There will be \$11,000,000 retained in the treasury for betterments, extensions, acquisitions, etc., and a portion of this amount will be used for the purpose indicated.

The new Continental Trust company, in which Senator Hanna is interested, will finance the combined electric-lighting and telephone companies.

Independent Telephone System for Chicago.

Chicago is now assured of an independent telephone system, so far as the granting of franchises is concerned, the ordinance finally adopted by the City Council on February 20th, granting the Illinois Telephone and Telegraph company a franchise, having become a law by limitation. The mayor promised, however, to sign the ordinance. When the City Council met Alderman Novak moved the minutes of the previous meeting be amended so as to show the passage of an amendment at the previous meeting binding the company to keep in repair for one year all streets it may tear up. This was agreed to, and, the mayor having no further changes to suggest, the ordinance became a law by virtue of the fact that the time had gone by when he could interpose any more vetoes. The ordinance has not yet been accepted by the company, but it is anticipated that it will be formally accepted as submitted by the city.

Edward Wellington Hurst.

Each year the independent telephone movement brings new faces into prominence in the electrical field. Among the latest to win special recognition for contributions of unusual value is the subject of this sketch, Edward Wellington Hurst, chief electrician and general manager for the Farr Telephone and Construction Supply company of Chicago. Mr. Hurst was born in Courtright, Ont., in 1865, and after completing his education he entered the electrical field at Detroit, Mich., in 1885, where he



EDWARD WELLINGTON HURST.

quickly took a prominent place among the electrical workers in that field.

Mr. Hurst engaged with the Farr company at the time of its organization, soon after becoming a partner in the concern. Mr. Hurst is a bright, pushing young man, and it is a pleasure to do business with him. Mr. Hurst is entitled to a considerable share of the credit for building up the splendid business which the Farr company now enjoys.

Comic Opera by Telephone.

The Chicago Telephone company treated some of its subscribers last week to the opera, "The Charlatan," which De Wolf Hopper was singing at the Columbia. One 10-inch transmitter and two small transmitters were set in the footlights, one on each side of the proscenium, and two large ones in the wings. Different exchanges were favored each night during the week, and many subscribers took advantage of the innovation.

Should this experiment be successful the telephone company says it may continue the service, furnishing subscribers not only with the musical events by telephone, but comedy, drama, and vaudeville as well. And even sermons by prominent preachers may be added to the list, transmitting the church musical service as well. During the experimental period the telephone company has put as many as a dozen receivers on one instrument in residences, so that this number of people may hear the opera in a home party.

General Manager A. S. Hibbard of the Chicago Telephone company, speaking of the introduction of the theater service, said:

Experiments in the way of transmitting music by telephone have been tried from time to time in various parts of the world. In this country perhaps the most extended success of transmission of music has been made in Milwaukee, where music from the Palm Garden is transmitted by telephone and may be heard in the evening. Little has been done in the way of attempts to transmit music and dialogue as an opera, as it involves greater difficulties than the ordinary transmission of music. Instruments which are adjusted properly for music transmission will not in all cases transmit the spoken words or dialogue.

Then, again, the actors move from place to place on the stage and get out of focus with the transmitters.

In the experiments which have been tried this week at the Columbia Theater three transmitters have been used, which are under the control of a switchman seated at one side of the stage. As the act is moved about from place to place or the work changes from music to dialogue he throws on or off the different transmitters best adapted to the work and gets, perhaps, better results in these respects than have been obtained elsewhere.

Roosevelt Patent Litigation.

The opinion of Judge Woods in the case of the Western Electric company, appellant, against the Western Telephone Construction company and others, appellees, on appeal from the Circuit Court of the United States for the Northern District of Illinois, has been handed down in the United States Circuit Court of Appeals for the Seventh Circuit, Judges Woods, Jenkins and Showalter being present. The suit was brought to obtain an accounting and injunction against infringement of United States patent 215,837, issued on May 27, 1879, to Hilborne L. Roosevelt of New York for an "improvement in telephone switches." The case has excited great interest in the independent telephone field, and the successful defense of the Western Telephone Construction company is a matter of common gratification to all engaged in the independent business. Judge Woods' opinion is appended:

"The Roosevelt patent is for a mechanism purely. It is designed for use in connection with telephones, but its essential character is no more affected by that fact than the character of a device for opening and closing the gate in a head-race would be affected by the fact of its use for turning off and on and regulating a current of water on its way to a mill-wheel. The electric currents, whether carried upon the wires of a telephone or a telegraph, were not new and by no pretense can be brought within or made to affect the scope of this patent. Switches employed in telegraphic and telephonic devices to shift the electric current from one wire to another were not new. Such a switch, connected permanently at one end with a current-conducting wire—X in the patent—and capable of being shifted at its other end from one point of contact to another—as from P to A in the patent—was a matter of common knowledge, and the problem for the solution of which Roosevelt obtained a patent was to effect that shifting automatically. That problem was not a whit different mechanically because the purpose was to shift and direct the passage of electricity over wires than it would have been if the wires had been tubes through which the passage of a liquid was to be determined by the opening and closing of valves by means of a shifting switch or lever. It was, of course, no problem at all to mechanics of ordinary skill, after the telephone was invented, with a switch in position, to devise means of shifting the movable end from the point of normal contact to the other point prepared for it; but if the like had never been done before, it would doubtless have been an inventive achievement to provide for an automatic movement of the switch which should be effected by the mere use of the telephone in the ordinary way in the hand of an unskilled operator. The like had been done, however, by Cushman when he devised a signal box for fire alarms with a switch mechanism so constructed and arranged that the shutting of the outer door of the signal box switches the electromagnets out of the telegraphic circuit.' That switch, as a mechanism, is not to be distinguished from this of the patent because the particular results to be accomplished are not the same and are not brought about exactly in the same way. The shifting of currents by a switch is one thing; the subsequent course of the currents and what they do or what is done with them are different things, unaffected by and without effect upon the character of the switch. So, too, the idea and a form of automatic switch are illustrated in the hurglar alarm of Fontaine. It is, therefore, impossible, even without looking for automatic switches in the mechanic arts outside of electrical devices, to concede to this patent the character of a pioneer invention. It need not be said that there was no degree of invention in so connecting the transmitting instrument with the spring-switch that the unskilled operator, without intending or understanding the result, should accomplish the necessary movement of the switch merely by lifting the instrument, and, on quitting, should involuntarily and with equal want of understanding restore the switch to its normal position simply by releasing his hold of the instrument. This, the specification puts beyond doubt, was what the patentee supposed he had accomplished, and, the invention being from necessity very narrow, there is no good reason for giving a wider scope to the claims of the patent, even if by their terms they are not so limited. In the second, third and seventh claims the transmitting instrument is described as suspended to the switch, and the same meaning is made evident in the first claim, by the terms of which the switches 'to be placed in contact with one screw point through the influence of the telephone when not being used,' and 'is freed from the influence of the telephone, substantially as described.'

"No claim of the patent can fairly be given a construction which would include either form of apparatus manufactured by the appellees.

"The decree below is therefore affirmed."

Judge Showalter did not participate in this decision.

Signal-current Generators for Telephone Exchanges.

By H. P. CLAUSEN.

When the capacity of a telephone-exchange system rises above several hundred subscribers the need is felt for labor-saving appliances, chiefly in the work that must be performed by the switchboard operator. This may be divided into several operations, namely, answering calls, calling subscribers, interconnecting subscribers, supervising such interconnections and dissolving the interconnections. However, the limited scope of this article covers only such apparatus as is required for the second or calling operation.

As a rule, the switchboard operator is apprised of a subscriber's desire for a communication by the falling of an annunciator shutter or lighting of a lamp. The signal is then responded to by the operator, either by inserting a plug, pressing a button or other means that may have been provided in the switchboard equipment. Upon learning the subscriber's needs the operator's next duty is to learn whether the desired correspondent's line is free for allowing his signal-receiving apparatus to be sounded. If, on testing or by observation, it is found that the called-for subscriber's line is not already in use the operator's next duty will be to project a signaling current over the circuit. This brings us to the operation which it is the purpose of this article to describe.

The signaling current for sending out over the line may be (as is the case in the smaller exchange systems) generated by the switchboard operator, while driving an electric generator; however, this operation consumes so much of the switchboard operator's time that it soon becomes a burdensome duty for the operator. In the smaller exchange systems the hand-driven magneto-generator can be employed with good results; in the larger systems, however, where the time consumed while interconnecting the subscribers must necessarily be less, the necessity arises for providing some other means for ringing the subscribers' telephone bells; in other words, the electric generator must be driven by some external source of power, such as an electric, gas, water or oil motor. Whichever type of driving engine may be employed, it is essential that its speed should be fairly constant; moreover, its power should be such that even with three or four operators ringing out at the same time its speed shall not be seriously affected. Another important feature provided should be that its internal resistance should be comparatively low, depending, of course, somewhat on the size of the generator armature and field magnets.

In the telephone exchange the magneto-generator is installed as an adjunct to the hand generator placed at every operator's position on the switchboard; and during the busy hours, at least, the power generator is kept in motion. The operator's ringing cam is so constructed that whenever it is depressed or drawn in a certain direction, the current generated by the constantly driven power generator flows over the connected subscriber's line and performs its functions. When a large number of operators must be supplied with current from one common power generator, the wires may be connected direct to every operator's ringing keys. There is this objection, however. The power generator may on a short-circuit produce a current of at least one or two amperes. Such a current, if allowed to act directly on a delicate spring, would rapidly destroy its usefulness by reason of the heating effect; moreover, the contacts in an operator's circuit-changer would soon become seriously burned if used while conducting current to a line which may be of a very low resistance, or even short-circuited. In order to avoid this and still allow the operator to ring out on the subscriber's lines it is the usual practice to insert a non-inductive resistance between the generator and the operator's ringing keys. This resistance might be, for example, 300 ohms, and a substance of like resistance would be inserted between the power-generator mains and ringing cams at every operator's position; thus, no two operators would be drawing current from the mains through a common non-inductive resistance, nor would the power generator's electromotive force be high enough for forcing a very large current through the 300 ohms resistance.

The speed at which power generators should be driven depends chiefly on the construction of the magneto-bells employed at the subscribers' stations. As a rule, 800 or 900 revolutions per minute will answer, the exact rate of revolutions being determined by an actual trial. Fig. 1 shows a magneto-generator driven by an external source of power. It also shows how the operator's positions, *A, B, C, D, E, F*, and *G*, are connected to the power-generator mains by means of the wires, *A', B', C', etc.* Fig. 2 shows an electric motor whose armature has two windings, the primary to suit whatever current may be available for driving the motor and the secondary for producing an alternating current at about 75 volts pressure. The current is taken from the machine by a pair of collecting rings and brushes.

Another plan which may be used is shown by Fig. 3. It consists of a comparatively large number of batteries connected to several properly disposed contacts of a pendulum pole-changing arrangement, which, alternately and reversely, connects the battery terminals to the power-generator mains. Referring to the figure, a series of 25 batteries is shown at *P, B*, with their opposite poles connected to the terminals *P* and *P'*. One of the power-generator mains connects to the armature *A* and the contact piece

AP, which is fastened to the pendulum rod. The remaining power-generator wire connects to a stationary contact *PC*. Thus it will be observed that when the pendulum is in the position shown the power-generator mains are fed by the battery as follows: *PG, M, A, AP, P', P, B, P, B', P, PC* and *PG'*. When the pendulum swings to the opposite side the circuits are exactly similar, with the exception that the contact piece *AP* forces itself against the spring *P*, causing it to break contact with its stationary contact *PC*. Now it will be seen that

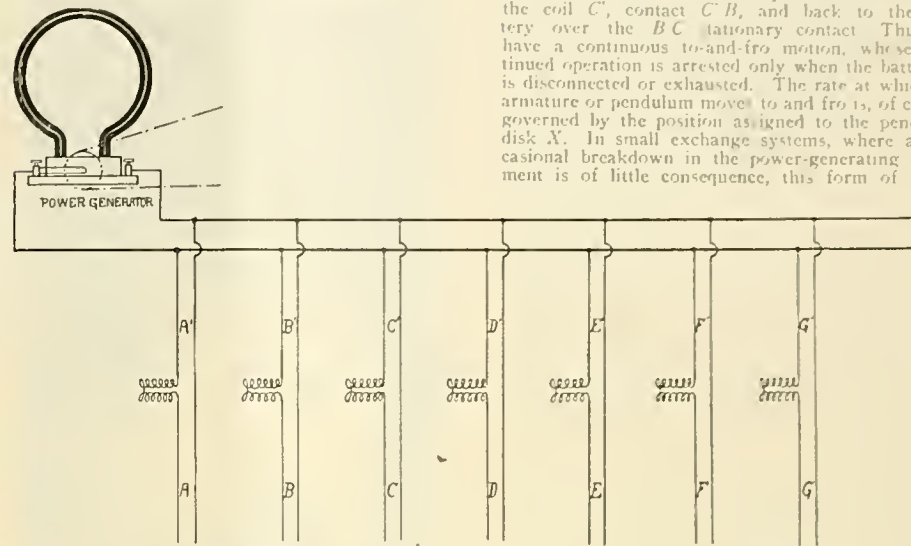


Fig. 1.

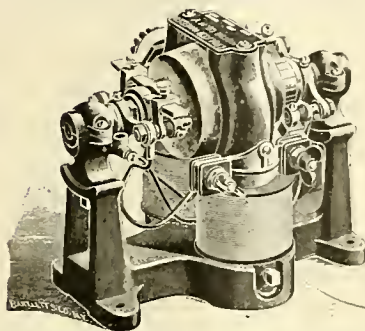


Fig. 2.

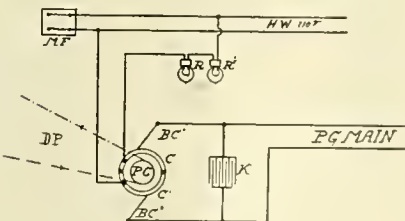


Fig. 4.

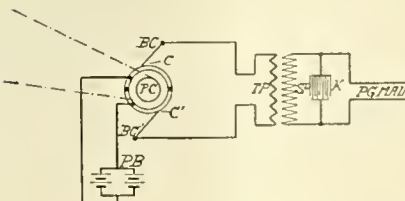


Fig. 6.

traversed by a current as follows: *B, C, CB, BC* and back to *B*. In this position the electromagnet *C* is drawing the armature *A* toward itself, which in effect, tends to allow the *P* spring to make connection with the *PC* stationary contact, and further allows the *P* spring to make connection with the *AP* contact piece on the pendulum rod. At the same time the *CB* spring makes connection with the *BC* stationary contact, while the *CB* spring is being forced away from it. Thus, in effect, causes the current from the battery *B* to flow through the coil *C*, contact *CB*, and back to the battery over the *BC* stationary contact. Thus we have a continuous to-and-fro motion, whose continued operation is arrested only when the battery *B* is disconnected or exhausted. The rate at which the armature or pendulum moves to and fro is, of course, governed by the position assigned to the pendulum disk *X*. In small exchange systems, where an occasional breakdown in the power-generating equipment is of little consequence, this form of equip-

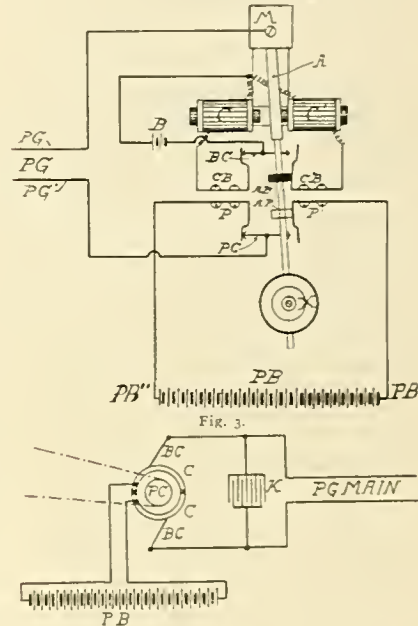


Fig. 3.

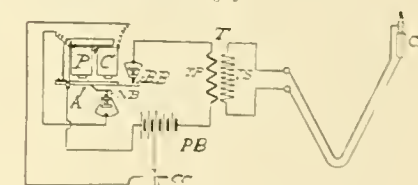


Fig. 5.

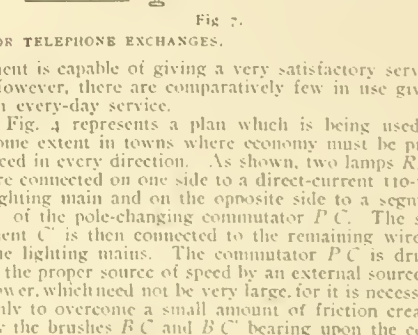


Fig. 7.

SIGNAL-CURRENT GENERATORS FOR TELEPHONE EXCHANGES.

instead of the *P'* terminal, we have the *P* terminal connected to the *PG* wire, this giving the required reversal of polarity for sounding magneto or polarized electric bells. In order to allow the pendulum pole-changing equipment to give practical service it is necessary that the pendulum shall keep up a constant to-and-fro motion, with a certain predetermined number of oscillations per minute, which is accomplished in the following manner: The armature, it will be observed, is pivoted or hung from a pivot at *M*, which, at the same time, is used as a polarizing magnet for polarizing the armature *A*, as also the electromagnets *C* and *C'*. Near the extreme bottom of the armature rod the pendulum disk *X* is placed, it being adjustable either up or down. Somewhat above the *AP* contact piece, which is fastened to the armature rod, there is another contact piece, marked *AB*, which may be of a non-conducting substance. At *CB* and *C'B* we have two springs operating in conjunction with the stationary contact *BC*; there is also the battery *B* and the electromagnet coils *C* and *C'*, which are connected in such a manner that whenever the battery current passes through the windings a strong pull is exerted upon the armature *A*, as shown in the cut, the coil *C* being

ment is capable of giving a very satisfactory service. However, there are comparatively few in use giving an every-day service.

Fig. 4 represents a plan which is being used to some extent in towns where economy must be practiced in every direction. As shown, two lamps *R, R'* are connected on one side to a direct-current 110-volt lighting main and on the opposite side to a segment *C* of the pole-changing commutator *PC*. The segment *C* is then connected to the remaining wire of the lighting mains. The commutator *PC* is driven at the proper source of speed by an external source of power, which need not be very large, for it is necessary only to overcome a small amount of friction created by the brushes *BC* and *B'C'* bearing upon the commutator. The lamps should be of the 10 candle power, 110-volt type. With this form of equipment and, in fact, also with the equipment shown in Fig. 3, it is necessary to connect a condenser *K* across the power-generator wires in order to obliterate the effects of a disturbing inductive current (principally in common-return systems) which is set up in wires running quite near and in parallel to a wire being traversed by alternating currents whose potential is almost at its maximum height in every stage of its

flow. In other words, we have a complete break in the flow of current with every change in direction, whereas there is a gradual rise and fall in the current when a magneto-electric generator is employed.

Fig. 5 shows another arrangement where we have the same pole-changing commutator arrangement *PC* as shown in the preceding figure. We also have the brushes *BC* and *BC'*, but, instead of the 110-volt lighting mains, we have a number of batteries *PB* connected to the commutator segments *C* and *C'*. As observed in Figs. 3 and 4, the condenser *K* should also be connected across the power-generator mains. Fig. 6 represents a form of power-generating equipment where the batteries *PB* are connected for giving a large quantity of current. Batteries are connected to the segments of the pole-changer *PC*. The brushes *BC* and *BC'* are connected to the primary winding *TB* of a static transformer, whose secondary *SP* is connected to the power-generator mains, bridged by the condenser *K*. Now when the commutator is in operation the battery current is made to flow through the primary winding, first in one and then in another direction, thereby producing an induced current in the secondary winding *SP*, having the proper difference of potential. The condenser *K* may or may not be connected across the mains, depending somewhat on the transformer construction and character of the line to be rung over.

Thus far we have dealt only with such power-generating arrangements as require the generator or pole-changing apparatus to be kept in constant motion. It may, however, be desirable to describe a system in which the power-generating equipment is in action only when required for transmitting a signal.

Fig. 7 does not represent what might be considered an effective piece of apparatus for ringing more than one subscriber's bell at a time. It does, however, suggest something which should appeal to the superintendent's practical sense immediately, namely, an arrangement with which the forgetful subscriber, who makes a practice of leaving his telephone off the hook-switch, may be called.

The ordinary alternating-current telephone generator, it is well understood, produces about 1,000 cycles of current per minute, these impulses of current, while flowing through a magneto-bell, causing its armature to strike alternately first one and then the other gong for the required signal. However, with the receiver removed from the switch-hook and the magneto-bell cut out of circuit, the subscriber could not be called to the telephone, the receiver alone being left in circuit. Under favorable conditions the ringing currents in passing through the telephone receiver might cause the diaphragm to emit a cracking noise sufficiently loud to attract attention. As a rule, however, this form of signal cannot be relied upon, the alternations being far too slow for producing anything but a dull sound from the rigidly clamped diaphragm. Referring then to the cut, it will be observed that we have a static transformer *T*, whose secondary *TS* connects to the plug *CP*. The primary winding of the transformer connects to the set of batteries *PB* through a normally open make-and-break contact *BB*, which is controlled by the push-button *CC*, electromagnets *PC*, armature *A* and battery *PB*, operating in conjunction, as follows: The button *CC* on being pressed causes the current from two cells of the *PB* battery to flow into the armature *A*, over the resting contact *VB* and through the electromagnet coils *PC*, energizing the magnet cores. This results in the armature *A* being successively drawn upward and again released, by reason of a break in the battery circuit at *VB*. As long as the button *CC* remains closed, the make-and-break movement continues at the rate of, say, 40 breaks per second, or 2,400 breaks per minute. While the armature is vibrating the *PB* battery interruptedly completes its circuit at *BB* and sends impulses of current through the primary transformer winding, which, in the well-known manner, causes an alternating current to flow from the secondary winding, one cycle for each make-and-break, that is, 2,400 cycles or 4,800 alternations of current per minute. Now if such currents are sent through a telephone receiver its diaphragm produces a very sharp and piercing sound, which frequently possesses a greater penetrating power than the vibration of telephone bells.

EXTENSIONS AND IMPROVEMENTS.

The Lee County Telephone company of Dixon, Ill., claims to be one of the most successful enterprises of this kind in the country. Beginning in October, 1896, the company made a complete circuit of the county, putting in no less than 14 exchanges, at Amboy, Harmon, Shaw, Sublette, West Brooklyn, Compton, Eldena, Paw Paw, Lee, Lee Center, Steward, Ashton, Franklin Grove and Dixon. At the last-named point it now has 310 subscribers, although it is in direct competition with the Central Union Telephone company, which had 150 subscribers. The Lee County company now has all of these old Bell subscribers with the exception of about 25. The system is all paid for and the company has money in the treasury. The entire management, from securing lines, setting poles, buying material and tools, and paying employees, and getting subscribers, has been done by the president and general manager, L. D. Parker, to the great satisfaction of all concerned.

Matchless Electric Lighter.

The accompanying cut (Fig. 1) shows the "ever-ready" portable stand lighter made by Stanley & Patterson, 32 and 34 Frankfort street, New York. It is designed to furnish a light by electricity where otherwise a match, burning gas jet or other flame would be required. It is made in wall-bracket form as well as in the portable pattern, and is especially adapted for use in smoking-rooms, hotels, cigar



FIG. 1. MATCHLESS ELECTRIC LIGHTER.

stores, marine work, palace cars, apartment houses, office buildings, private residences, and, in fact, in all places where cleanliness and freedom from danger from discarded matches are desired. The advantages of the device are safety, cleanliness and attractiveness, and it is said that the cost of maintenance is about a cent a month. The body of the lighters is of white china. The lighter may be attached to electric-light sockets by plug and cord, or may be operated by two cells of dry battery and an ordinary gas-lighting spark coil. On electric-light circuits it requires no attention from one year to another, save moistening the asbestos packing in the torch, which is said to be necessary usually about twice a month,

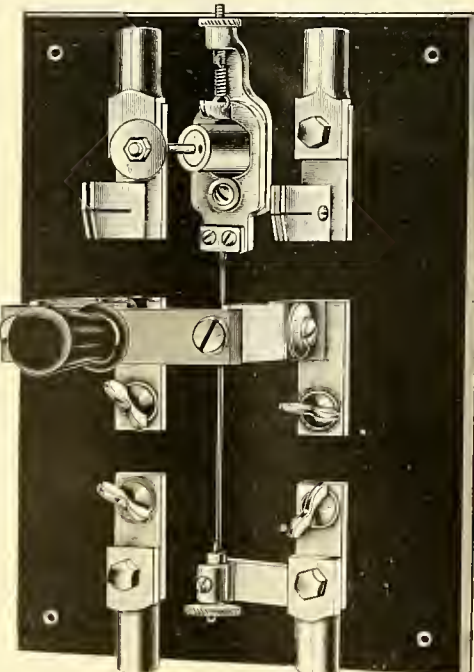


Fig. 1.

A NEW CIRCUIT BREAKER.

with ordinary usage. The diagram of connections is given in Fig. 2.

Statistics of fire-insurance companies, the manufacturers say, demonstrate that two-thirds of all fire losses are caused by discarded matches. The Matchless electric lighter renders the use of matches in any building unnecessary, and with their discarding, is eliminated the greatest source of danger from fire. Its adaptability to marine work is demonstrated by the satisfaction which the installation of lighters on Mr. Howard Gould's steam yacht Niagara has given. Thirty-eight of the lighters were placed on one circuit on this yacht and have never, it is said, given a moment's trouble. It is also pointed out that in hotels and private dwellings the lighter prevents the

marring of fine furniture and polished woodwork by the careless scratching of matches, as well as the damage often done to a polished table or desk by the dropping of a heated match-tip upon its surface. Stanley & Patterson add: "If the torch of the Matchless electric lighter should accidentally drop to the floor, the flame can do no damage, as it is always an inch above the surface upon which the torch may rest, and within a minute will, of its own accord, become extinguished. Inverting the torch by replacing it in the lighter will, however, render it operative after a moment's rest. The packing of the torch is fireproof asbestos, and no liquid is present at any time in any part of the lighter. Contact points are of cold rolled steel."

A New Circuit Breaker.

McCarthy Bros. & Ford of Buffalo, N. Y., have placed upon the market the Buffalo expansion circuit-breaker, for which they claim the advantages of simplicity, reliability and low cost.

This breaker is an attachment placed on an ordi-

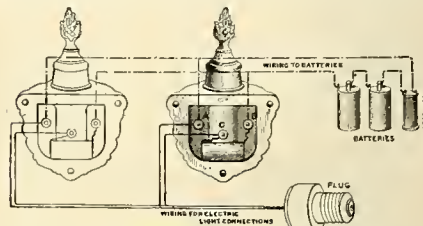


FIG. 2. MATCHLESS ELECTRIC LIGHTER.

nary knife switch, and in this way the complete instrument performs the service of a knife switch and a circuit breaker. The switch can be used the same as an ordinary knife switch without reference whatever to the breaker attachment, thus doing away with the necessity of a switch separate from the circuit breaker.

As the name implies, this breaker is operated on the expansion principle, the current being conducted over a thermal rod having large expansive properties. This rod actuates the tripping device which holds the opening spring in a closed position. Upon the passage of an excessive current over this rod, the latter expands and, releasing the spring, opens the switch. The switch, when opened by the breaker attachment, can be again closed the same as an ordinary switch and is immediately ready for service again. The thermal rod will open the switch before

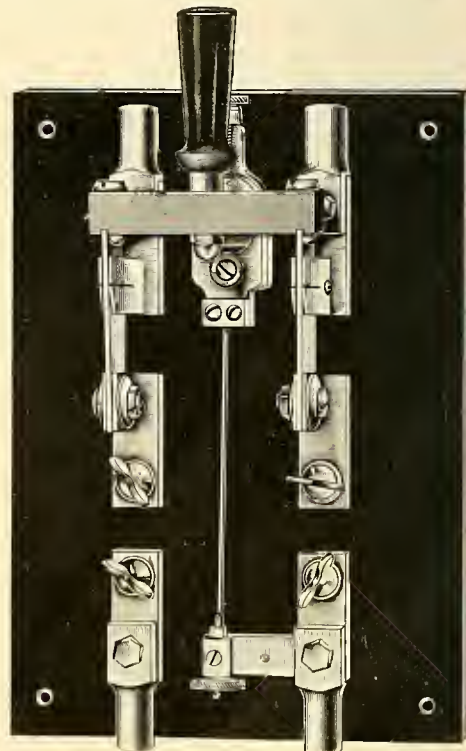


Fig. 2.

heating to such an extent as to be unbearable to the hand.

This circuit breaker is said to be equal in every respect to magnetic circuit breakers and superior for some classes of work, especially for motors, as the time value may be made as large or small as desired. The magnetic circuit breaker has to be set at a current which is considerably above the normal current capacity of the motor, in order that the circuit be not opened with the first rush of the current to the motor in starting. The expansion breaker will take care of the first rush of current, while a continuous flowing current will open the circuit in five or 10 seconds, or one minute, according to adjustment.

All the Buffalo expansion circuit breakers are

furnished with fuse terminals as an extra precaution against accidental disablement of the breaker attachment. If anything should happen to the latter a set of ordinary fuses could be inserted in the circuit until necessary repairs could be made. These breakers are made single, double and triple-pole, single or double throw, with switches either single or double-break and for any voltage and alternating or direct current. Front or back connections, with or without carbon breaks, may be made. Sizes range from 25 to 200 amperes. Fig. 1 shows a 25 ampere single-break, double-pole circuit breaker of this type open, while Fig. 2 represents the device closed.

Argentine Electrical News.

[From the Buenos Aires correspondent of the WESTERN ELECTRICIAN.]

The letter written by the representative of the Metropolitana Tramway company to one of the daily papers here shows how some of the companies are held by the municipality. This company was authorized by councils to change the old horse-car system to electric traction, and now after considerable delay the mayor, or "Intendente," has vetoed the concession, as councils did not insist on the clause in relation to the free lighting of the streets. The representative in his letter shows that the company has already contributed \$450,000 toward the cost of paving the streets through which its system runs and that its annual receipts are only \$80,000. He further states that the street lighting as insisted on by the mayor means the establishing and maintaining of 400 arc lamps, which would require an outlay of \$242,476, and a yearly cost of \$92,070 for supplying current, etc., which is greatly above the gross revenue of the company. Further, he states that the change of the system from horse to electric traction will cost the company about one and a quarter million dollars—gold. If all of these statements are correct, and it is presumed that they are, it can readily be seen that these companies are working at a disadvantage, as compared with those in cities in the United States. It would seem extremely burdensome to force traction companies to give public lighting in addition to the 6 per cent. tax which they are all forced to pay, but the mayor of Buenos Aires thinks that even with these exacting conditions attached the transportation lines must still have a "wee bit" of the receipts left at the end of the year for distribution as dividends to the stockholders, in view of the avidity with which concession for car lines and electric-lighting companies are purchased from the concessionaires by English and German companies. Practically all of the traction and electric companies in this republic are almost wholly controlled by English, German and French capital.

Two new companies were registered in London lately for the purpose of acquiring, building and working rail and tram lines, telegraph and telephone systems; to carry on mercantile, commercial, trading and financial operations; as stock and share dealers, electricians and electrical engineers, engineers and iron founders, etc. The South American Electric company, limited, with a capital of \$500,000, has as its main object to adopt and carry into effect an agreement between the General Electric company of New York and Charles Bright. The other company is "Charles Bright & Co., limited," with a capital of \$1,000,000 in \$100 shares.

During the past week the City Council imposed a tax of 5 per cent. on the gross revenue of the electric-light companies of Buenos Ayres, instead of 3 per cent., as at present, for the use of the subsoil in which their mains are laid. It is rumored that the General Electric company of New York will shortly open a branch office in Buenos Aires for the supply of all the material it manufactures. It is to be hoped that the rumor is true, as it will be a great convenience to the trade and save several months in obtaining goods. C. P. R.

Electric Vehicle Business.

Articles of incorporation were filed in New Jersey last week by the New York Electric Vehicle Transportation company, with an authorized capital of \$25,000,000. The company is empowered to acquire and manufacture, buy and sell vehicles of all kinds to be operated by electricity, compressed air, gas, oil and other means of motive power; also to acquire franchises for operating these vehicles to carry passengers and freight of all descriptions. The incorporators are James E. Hayes, Camden, and C. F. Graetz and Augustus Treadwell of New York. Mr. Treadwell is employed by the Electric Storage Battery company, which is behind the new company. President Isaac L. Rice of the Storage Battery company said to a New York *Sun* reporter that the new company was but an enlargement of the Electric Vehicle company, which for some time has been operating electric cabs in that city. The business of the Electric Vehicle company, of which Mr. Rice is also president, has been increasing largely. It is pointed out that this company may be a possible competitor to Richard Croker's Auto-truck company.

From Philadelphia comes the news that articles have been filed with the Secretary of State of New Jersey changing the name of the Philadelphia Motor-wagon company to the Pennsylvania Electric Vehicle company, and increasing the authorized capital

stock from \$3,000,000 to \$6,000,000. The company is authorized to make and deal in self-propelled vehicles. The incorporators are Cornelius W. Woodward and William J. Jackson of Philadelphia and Josiah S. Dubois of Camden. This is also an evident offshoot of the Electric Storage Battery company.

Burglars in a Power House.

A dispatch from Rutherford, N. J., to the New York *Tribune* relates that three burglars made a bold attempt at robbery at the power house of the Union Traction company, in East Rutherford, a short time since. It was about 2:30 a. m., and one man stood guard outside, while two others, wearing masks, entered the power house, made the employes hold up their hands at the point of loaded pistols and shot one man who declined to obey. The robbers escaped without any booty.

Charles H. Tyler of Rutherford, night foreman, was washing out a closed car in the shed, using a mop on a long handle, when a masked man suddenly appeared at the car entrance, pointed a pistol at him and commanded him to hold up his hands. Tyler thought some of the employes were attempting to play a practical joke, and he threw the mop at the man with considerable force, striking him in the face. With an exclamation of anger the burglar rushed forward, and Tyler, seeing that he was in earnest, darted for the engine room, closely followed by the masked man, who shot at him, wounding him in the leg. Tyler flung open the engine-room door, but found another masked burglar in control.

Wallace Jones, the night engineer, had been reading when the door from the fire-room opened. A masked man pointed a pistol at him and ordered him to throw up his hands. The two men placed Tyler and Jones with their faces to the wall, and then found Harry Watson, the night fireman, asleep on the floor. He was put with them, and one robber, with a pistol in each hand, stood guard.

As the other robber went out into the carshed a door opened and John A. Bainton, a motorman, and one of East Rutherford's marshals, put out his head. A pistol was shoved in his face. He slammed the door, and getting out of a side door, ran away. In the same room James Malone, a motorman, was asleep. He says the burglar came into the room, looked around and then went away. As soon as it was known that Bainton had escaped the burglars backed down the carshed, with their pistols pointing at the three men in the engine room, went out one of the front doors, joined their sentinel outside and escaped.

The robbers entered the carhouse by forcing a window in the fire-room. Their object was probably to break open the small safe in which conductors drop the envelopes with their receipts. This is in the carshed, fastened to the wall, but it had only one day's receipts inside, and, owing to a storm, the amount was not more than \$50. There is a large safe in the office. After the robbers went away Tyler was taken to a Rutherford drug store and his wound was dressed, the pistol ball having gone through his leg.

Cloth Pressing by Electricity.¹

By W. P. ATWELL.

At a recent meeting of the Industrial society of Elbeuf a report was made by Mr. C. Mouchel, on a new process invented by Mr. Chedville, which is known as the "electro-calidor" process, and consists of pressing cloth by means of boards heated by electricity.

A special committee appointed for the purpose examined the manufacture and operation of the press boards. The result is declared to be most satisfactory, and the report is as follows:

The body of the press board is composed of asbestos paste covered by a coating of German silver. This is again covered by paper pulp, which gives a pliable surface without materially increasing the thickness of the press board, which measures from two to four millimeters (0.078 to 0.157 inch). The first experiments were made by applying the electric current through holes pierced in the portion of the board projecting beyond the cloth. Experience, however, has led to the adoption of press boards with a trapezoid projection, of which the two obtuse angles are covered with copper. Spring clips, provided with a metal connection and attached to a pliable conductor, serve to transmit the electric current to the copper-covered corners of the boards when the press is arranged for work.

The electric press boards are used in the following manner: On a plate of sheet-iron is placed a piece of cloth, between the folds of which are placed at equal distances three electric press boards; then there is another plate of sheet-iron, another piece of cloth, and so on until the press is full. An ordinary press holds six pieces, the folds of the cloth being one meter (1.09 yards) wide.

The Messrs. Blin employ a system of hollow presses, and an iron track sufficiently long to accommodate ten communicators with each one of their hydraulic presses. Against the ceiling and parallel with this track are arranged two conductors, one positive and one negative. They are placed on either side and a little beyond the line of the track. Large clips for transmitting the electric current are attached by pliable wires to these conductors. The hollow press is then placed between two of these clips, each of which communicates with a movable vertical distributor.

The distributor is a simple grooved rod, the conductor being placed in the groove. Thirty pliable wires, each terminating in a spring clip, hang at equal distances from this distributor.

The clips are readily adjusted to the metal corners of the electric press boards, the positive on one side and the negative on the other. The circuit is thus established and the proper degree of heat generated, the time necessary varying from three fourths of an hour to one hour and a half.

The required current for a press board measuring one meter (1.09 yards) by 70 centimeters (27.5 inches) is two amperes under a pressure of 10 volts. A press of eight pieces, with 21 press boards, demands a current of 48 amperes to heat the press, and the amount of electric force ex-

pendent in one hour and a half is as follows: $48 \times 110 \times 1.5 \times 750$ watts per hour. The mechanical force, given a dynamo of 90 per cent. working capacity is $\frac{48 \times 110 \times 750}{1000}$ horse power. The labor expended in one hour and a half is as follows: $12.5 \times 1.5 \times 1875$ horse power per hour.

Supposing a consumption of 1.5 kilograms of coal per horse power per hour, the quantity of coal necessary to heat a press may be estimated at about 30 kilograms (66 pounds). Estimating coal at 25 francs (81.5 cent.) per ton, the maximum cost of heating a press would then be 75 centimes (24 cents).

Comparison being made between the amount of coal required by the new system of pressing and the coal for direct heating in a special oven by means of sheet iron plates interposed between the folds of the cloth, it is found that the old method is six times dearer than the new, as the Messrs. Blin have used the old system with all little waste as possible and had no pressure per day, state that they used at least a ton of coal a day for the heating of their plates, which involve an expenditure of 25 francs (81.5 cent.) for the press, as used, by 1.10 francs (21 cents) per press.

There is thus an economy of fuel both the new system rather and more important point of superiority.

The first is the perfection of the work. The heating of each press, and even of each piece, can be regulated mathematically, either by varying the number of press boards or by increasing or diminishing the length of the heating. The cloth is heated slowly and without the inequalities resulting from the old system, under which the two ends of each piece were almost in contact with a plate heated to 550°. All manufacturers who have employed the new system speak of this point as a great advantage.

A second advantage is the extreme cleanliness with which the pressing can be effected. The old style of plates heated in an oven often resulted in soiling the cloth, which is now entirely avoided.

Another advantage is the economy in laborious handling necessitated by heating and transporting heavy cast-iron plates. The workshops can also be kept at a lower temperature, more favorable to the health of operators.

The heat generated in the folds of the cloth is completely utilized by the new process, and a fraction less is lost by radiation than under the old system of heating by plates.

If there is already an electric plant in the establishment (and few modern houses devoted to commerce or manufacture are without one), the expense is reduced. The boards are not costly, and with proper care will last several years.

Mr. Mouchel thinks that the process above described is, from all points of view, a most important invention and should be generally adopted.

COMMUNICATION.

Taxation, Trusts and Natural Monopolies.

To the Editor of the WESTERN ELECTRICIAN:

I was delighted with the article in a recent issue of your journal by Franklin H. Wentworth on "Aluminum as an Economic Factor." The writer in a most forceful and expressive style sets forth the true situation, not only in the copper field, but in the entire field of industry to-day.

Monopoly has come to be the dreaded corsair upon the perilous main of competition, and we are all (outside of the trusts) desiring a remedy. More than 900 trusts and combins are now clutching at the throat of the American people, and it is not surprising that the sleeping giant is at last coming to realize that he is being bound down by the cords of monopoly and special privileges, and I predict that in the very near future he will snap these cords as though they were paper strings, for monopoly always overreaches itself, and in many cases has already done so.

As I have said, Mr. Wentworth has ably set forth the serious phase of the copper monopoly as it affects electrical trade interests to-day. But what shall be said of his conclusions. I quote his closing words:

"If the holdings of the copper trust were assessed at their true value by the states in which they lie, it would not be necessary for the electrical industries to turn to aluminum for relief. We would have plenty of copper at a reasonable price." Just preceding this paragraph the writer quotes these words from Thomas G. Shearman's "Natural Taxation": "The trust, in so far as it is purely an economizer in production, is legitimate. Monopoly of natural resources is another matter. Monopolies of this sort are built up by unjust systems of taxation, and they can be easily destroyed by just systems of taxation."

To show the fallacy of the conclusions of both these writers let me briefly illustrate: Suppose a tax of 25 cents a gallon was levied on petroleum, in order "to tax out of existence" the Standard Oil trust; would this accomplish the purpose? Could not the monopoly simply raise the price of oil by the amount of the tax and thereby shift the tax onto the consumers of oil and still make its profit of "one hundred millions a year"? Or, suppose a tax were levied on copper to 2 cents a pound by the state of Michigan, could not the copper trust simply raise the price of copper the amount of the tax and still make the same profit?

Certainly it could and would. Any trust that has the exclusive monopoly of any natural product is complete master of the situation under competition. If some substitute is found for the product then it ceases to be a monopoly. But no form of taxation can reach the public evil which every private monopoly necessarily is.

I see but one remedy and I believe there is but one remedy, and that is public ownership of all natural monopolies. Legislation cannot and never has controlled private monopoly under competition, and as Mr. Wentworth well says, such attacks are "wrong in principle."

May I briefly call attention to another phase of this question?

I know of considerable capital now being held back from investment in electric-lighting machinery

¹ From advance United States consular report, February 23, 1899.

through fear that calcium carbide will soon be made so cheaply that it will largely drive out the electric-lighting industry. The installation of such machinery comes so high and the public is becoming so suspicious of profitable franchises that acetylene gas is coming in for a large measure of attention.

I am pleased to see so able a trade journal as the WESTERN ELECTRICIAN take up these questions, and I believe it behooves every business man to study the trade conditions of to-day with great care—even then he may be caught and swallowed up.

HENRY E. ALLEN.

Kingfisher, Okla.

American Institute of Electrical Engineers.

The nominations for officers for the American Institute of Electrical Engineers is now occupying the attention of members of the Institute. From the returns of nominating blanks filled out by members the council will select candidates for the official ticket at its meeting on March 22d.

CORRESPONDENCE.

New York Notes.

NEW YORK, February 27.—Everybody knows of the bitter attack that Tammany, with Richard Croker at its head, is making on the Manhattan Railway company. People are asking themselves the cause of it. The Manhattan company has been doing business a long time, but Tammany seems to have just awakened to the iniquity of its methods. One explanation advanced is that Mr. Croker and his associates were "short" on Manhattan stock and wanted to cause the price to drop to a point, said to be 90, where they could buy at a handsome profit. If this assumption is true the Tammany braves made a great miscalculation, for the stock has steadfastly remained steady at from 111 to 114. Another reason given is that Mr. Croker is seeking revenge for Mr. Gould's refusal to adopt compressed air rather than electricity for the new system of motive power on the elevated roads, while a third cause for Mr. Croker's anger is stated to be Mr. Gould's refusal to give the Tammany man's compressed-air company permission to attach its pipes to the elevated structures throughout the city.

Whatever the cause, all sorts of demands have been made on the company by various departments of the city government—some with some show of reason, but most of them unfair and unreasonable. The company says that it will not comply with any municipal regulation which is merely a tyrannical abuse of authority and will seek the protection of the courts. The most menacing of the Tammany demonstrations against Manhattan was the notice served by the Park Department on February 17th, revoking the right-of-way and license granted to the company for Battery Park, and ordering the removal of the elevated structure from that park within the next six months. This did not strike consternation in the Manhattan camp, however, and on February 20th Mr. Gould issued a statement to the stockholders, saying that a change to the electrical system of train operation was desired. The electrical project will be considered by the stockholders at their meeting to-morrow.

The Municipal Assembly passed two ordinances relating to the Manhattan road, one compelling the company to run trains on all its lines on not less than five minutes' headway during the 24 hours of each day, and the other ordering the placing of drip-pans under the entire length of the structures. It is said the latter ordinance, if enforced, would cost the company \$1,500,000, and it is further pointed out that with electrical operation there will be no use for drip-pans. Mayor Van Wyck has not signed the ordinances as yet and has appointed a hearing on the matter for Wednesday, March 1st, at 10:30 a. m.

There has been some talk of compromise between Tammany and Manhattan yesterday and to-day, but the fight is still on. Mr. Croker says that he is conducting a "holy war" on an unrighteous corporation. This is his declaration: "We want all corporate interests to do justice to the people who put us in office. Financiers may call this persecution, if they will. I don't care. It isn't persecution. It's a desire on our part to see that justice is done. We want these corporations to obey the law made by the people's representatives; not to make laws for themselves and override the will of the people." On the other hand, Mr. Dillon, counsel for the Manhattan company, asserts that the municipal "raid" is "the most pronounced Populistic attack upon vested interests that I have ever known. There has been nothing in the legislative or legal history of Texas, South Carolina, North Carolina or Kansas that approaches it. By Populistic attacks I mean attacks on vested rights under the form of law, and that is just what is attempted here. It out-herods anything ever done at any time in the worst Populistic state in the Union, and if it were possible to imagine that it could be successful, it would be the most serious blow ever dealt to property and vested interests in the country. It would discredit the city of New York and cover the state with shame." M. S.

Canadian Intelligence.

OTTAWA, February 25.—A movement is on foot in the city of Toronto to have all the ambulances of the city fitted out with electric motors and do away with horses altogether. This proposition is advanced on the ground that the ambulances could be worked with greater expedition.

By a vote of 399 to 61, the town of Orillia, Ont., passed a by-law authorizing the issue of debentures for \$75,000 for the purpose of installing an electrical-transmission power plant. With this sum it is proposed to bring 800 horse power from the Ragged Rapids on the Severn River, a distance of 19 miles overland. The contract has already been awarded to the Central Construction company of Buffalo, whose tender of \$67,200 for the complete plant, electrical and hydraulic, was the most satisfactory of those submitted. The power will be transmitted at 20,000 volts. It will be used for running the electric-light and waterworks plants, which are owned by the town, and for supplying private power users. This town will be the first municipality, it is said, on this continent to install an electric plant of its own for the purposes mentioned. It will be able to sell electrical power as low as \$13.50 per horse power per annum, it is claimed.

The Court of Appeal in Montreal has rendered an important judgment in the case of the Hull Electric company against the Ottawa Electric company. The result of the judgment is that the Ottawa company will be compelled to remove its poles from the streets of Hull, Que. The plaintiff company, by virtue of a by-law of the city of Hull, claimed a monopoly of erecting poles and conducting the electrical business in that city. Judgment was given in favor of the Hull company, and the Ottawa company was ordered to remove its poles from the streets of Hull. The exclusive franchise of the latter company is thus declared legal.

The Lake Megantic Pulp company of Quebec is asking power from the provincial Legislature to locate, construct and operate a branch or branches of railway from points on the Quebec Central railway and on the Canadian Pacific railway to any industrial establishments of the company in the townships of Whitton and Spalding.

Among other power asked by the Chateaugay and Northern Railway company of Quebec province is that to construct and operate a railway from any point in the boundary between the province and the state of New York, thence to a point in Soulanges County, to connect with the Montreal Island Belt Line railway, through Montreal and Hochelaga to a point on the Great Northern railway in the county of Joliette. The company also seeks permission to construct and operate an extension of its main line to and through the town of Berthier, and to construct and operate, by electricity, circuit lines of railways in towns, villages and parishes along its main line and branches.

The Montreal and Southern Counties Railway company has a charter which gives it a most extensive franchise on the south shore of the St. Lawrence River. It has the right to traverse some 17 different counties, connecting them with the city of Montreal. It is not known by which bridge the company proposes to cross the river, but arrangements will doubtless be made with either the Grand Trunk railway or the Canadian Pacific railway to do so. It is reported that the company counts upon doing a very large business in farm produce for the Montreal market, and members of the company pretend that arrangements for handling this produce and delivering it in good shape without trans-shipment in Montreal are so indifferent that various points in Ontario can supply the Montreal market better than the farmers of Quebec province.

It is currently reported that four prominent bar-riers of Ottawa will seek incorporation, at the next session of Dominion Parliament, as the Royal Telegraph company, with a capital of \$1,000,000. It is proposed to construct and operate telegraph and telephone lines throughout the Dominion.

There is an arrangement between the Dominion government and the electric-railway companies operating in most of the large cities of Canada, by which letter-carriers use the street cars in the performance of their duties. For this consideration the Montreal Street Railway company has been paid \$200 per month, but the postmaster-general was notified some time ago that the service would be discontinued on that basis. The railway company claims that a record of the work performed shows that at regular fares the sum to be charged would amount to over \$1,000 per month, and hence the refusal to renew the contract on the former terms. In Toronto the price paid is said to be \$400 per month.

Professor V. L. Emerson has perfected a process for the conversion of sawdust into smelting gases. The acetylene gas manufactured from sawdust has had great illuminating power, but it has not been useful for smelting purposes. Mr. Emerson undertook to perfect a process for the manufacture of smelting gas, and he is supported financially by a bank at Ottawa. This gas will be used to smelt iron, and the mines at Ironsides, near Ottawa, will be the first to use it.

At Ottawa capitalist, who has been negotiating for the purchase of automobile carriages for service in the capital of the Dominion has been notified that a Toronto agency for the manufacture of the carriages has been opened there. The agency is a

branch of a leading American firm, and carriages of all kinds will be built this year. The carriages which will be brought to Ottawa will be simple in construction and suitable for use on any street. The radius of operation will only be limited by the facilities for recharging the batteries.

It is understood that a company is being organized with a capital of about \$1,000,000, in Montreal, Boston and Paris, France, for the purpose of manufacturing calcium carbide on a large scale. The company will operate at the Shawinigan Falls, on the St. Maurice River, Quebec, utilizing part of the power being developed at that point by the Shawinigan Water and Power company. The company claims that it will operate under such great advantages at this location that it will be able to sell calcium carbide at greatly reduced prices.

The plant of the newly incorporated Metropolitan Electric company of Ottawa will cost in the neighborhood of \$300,000. It will have a capacity of 5,000 horse power, but only 2,000 of this power will be utilized at present. The power will be brought in from Britannia, about eight miles from the city, to a transforming station, at 10,000 volts, for transmission over the wires in the city, where it will be transformed to 2,000 volts. The power cost the company a short time ago \$20,000, but the company has since been offered \$80,000 for it.

The Toronto Electric Street Railway company's statement for the last year shows the net earnings to have been \$360,000. After paying four per cent. dividend the company carries forward to the rest account the sum of \$100,000, and thus swelling this account to nearly \$1,000,000. A. V. W.

PERSONAL.

Dr. H. S. Carhart of the University of Michigan was in Chicago early in the week. He lectured to the students of Lewis Institute on transformer design on Monday evening.

In a recent press dispatch from New York it was stated that Thomas A. Edison, Jr., and Miss Marie Louise Tuohy, an actress at the Casino Theater, were married last November. Because of troubles at the theater, it is stated, the lady announced the fact of her marriage two weeks ago.

Professor John B. Johnson, formerly of Washington University, St. Louis, has accepted the position of dean of the engineering faculty of the University of Wisconsin at Madison. Professor Johnson is a graduate of the University of Michigan and the author of engineering text-books.

Mr. I. N. Simpson, superintendent of the department of exhibits at the forthcoming exposition in Omaha, was in Chicago last week in the interest of the exhibition. Mr. Simpson was on his way east for the purpose of interesting manufacturers whose co-operation is desired by the Omaha exhibition.

Edwin Stanton Carpenter, assistant treasurer of the Westinghouse Electric and Manufacturing company and treasurer of the Walker company, died suddenly of heart disease in New York on February 16th. Mr. Carpenter was but 37 years old. His associates of the Westinghouse company held him in high esteem.

Lewis Miller of Akron, O., father-in-law of Thomas A. Edison, died in a New York hospital, after an operation, on February 17th. Mr. Miller was 70 years of age and a prominent manufacturer of agricultural machinery. He took a deep interest in Sunday-school work and founded the famous Chautauqua Assembly in 1874.

George B. M. Harvey, the new proprietor of the *North American Review*, has had much to do with the development of the electric railways of Staten Island and the Jersey Shore. He is 35 years old and began his career as a reporter on the *New York World*. He secured the friendship of William C. Whitney, with whom he formed a business connection in 1893. It is reported that he paid \$225,000 for the *Review*.

Bradner P. Holmes, manager of the Youngstown (Ohio) Electric Light company, died on February 13th at his home in Youngstown. Pneumonia was the cause of death. Mr. Holmes was well known and highly esteemed by a large number of friends and acquaintances in the electric-lighting business. He took an active interest in the affairs of the National Electric Light association and was president of the Ohio Gas Lighting association at the time of his death.

ELECTRIC LIGHTING.

The Greenville Light and Car company of Greenville, Miss., has secured the contract to light the city of Greenville with 60 or more arc lights of 2,000 candle power each for the term of 10 years, and has issued \$40,000 of bonds for the purpose of adding to its present electric-light business a small system of electric street railway, the construction of which it hopes to finish before July 1st. J. A. Gaboury is president of the company.

The mayor and aldermen of Sweetwater, Tenn., have granted a 20-year franchise with contract to the Sweetwater Telephone and Improvement company, for the erection of an electric-light plant. The company is to furnish the city 15 or more 2,000

candle power arc lights, and will also furnish 400 to 600 16 candle power incandescents for commercial and private use. It is in the market for an alternating-current dynamo, boilers, engine (75 to 100 horse power), wire fixtures and all material, except poles, for the complete construction of the plant, the plant to be completed by June 20th. D. L. Smith is the manager of the company.

The Singapore *Free Press* contains the following announcement: The Bangkok electric-light syndicate has disposed of its share of the plant and business to Capt. Anderson and Admiral de Richelieu, probably on behalf of a company. The government share of the business is to be acquired by the same interests. It is understood that the promoters of the new company will put new capital into the concern and install more machinery and dynamos, possibly with a view to combining with the tramway company." The same authority announces that "the preliminary operations in connection with the lighting for the fort at Colombo by electricity have been taken in hand by Mr. W. Simm, an engineer, who was specially got out for the purposes from the Insulated Wire company of Prescott, Lancashire. Thirty arc lamps are to be put up."

ELECTRIC RAILWAYS.

The capacity of the generating station of the South Side Elevated Railroad company of Chicago will be doubled this year. Contracts have been let for Allis engines and Westinghouse generators for two new units of 1,500 kilowatts each. This will bring the capacity of the plant up to 6,200 kilowatts, exclusive of the storage batteries.

According to the *Chicago Record* of February 28th Corporation Counsel Thornton has decided to begin damage suits against the three principal surface street-railway companies of Chicago for injury to the city's water-pipe system through electrolysis. A declaration in the case is being drawn by Assistant Corporation Counsel Jandus, and a large quantity of evidence has been collected by City Electrician Ellicott, to be used in the prosecution. The amount of the damages to be asked has not been decided upon. The basis of the contention will be that, owing to the neglect of the railway companies to properly provide for conducting their electric currents from the points where they leave the rails to the power house, damage to the city mains has resulted.

The final step in the consolidation of the Yerkes North, Northwest and West Side lines was taken a few days ago, when deeds were filed in the recorder's office conveying the property and franchises of the Chicago and Jefferson Urban Transit company, the North Chicago Electric Railway company, the Chicago Electric Transit company, the Cicero and Proviso Street Railway company, the Ogden Street Railway company, the North Side Electric Street Railway company and the Evanston Electric Railway company to the Chicago Traction company in consideration of \$1. The articles for the incorporation of the Chicago Traction company were filed at Springfield some time ago. The lines listed in the transfer are feeders to the main lines of Yerkes. The incorporators of the Chicago Traction company were directors and officers in the feeders. The main trunk line had guaranteed the interest on the bonds of the feeder companies and practically owned them.

POWER TRANSMISSION.

Mr. W. T. Baker's application for a franchise to enable the Snoqualmie Falls Power company to distribute electricity for manufacturing purposes in the streets of Tacoma, Wash., is still pending in the City Council. The *Tacoma Ledger* interviewed a large number of influential citizens on the subject, and the opinion was almost unanimous that the franchise, guarded by reasonable restrictions, should be granted immediately.

MISCELLANEOUS.

The Columbian Electric Car Lighting and Brake company, incorporated some time ago with an authorized capital stock of \$2,000, has filed papers at Trenton, N. J., increasing its stock to \$10,000,000.

The trustees of Michael Reese Hospital, Twenty-ninth street and Groveland avenue, Chicago, have decided to improve the hospital at an expense of \$50,-

000, and work on the improvements will be begun in the spring. Among the improvements to be put in is a new and complete electric plant, which will include all the latest inventions in the way of hospital lighting. A new heating plant will also be put in. Isaac Greensfelder is the president of the board of trustees.

The secretary of the navy has transmitted to Congress, to be included in the general deficiency bill, the following estimates of appropriations required by the Bureau of Yards and Docks, to restore the steam engineering buildings at the New York navy yard, and to replace the necessary power plant, tools and experimental implements and outfit connected with those buildings, which were destroyed by fire on February 15th: Power plant, with steam, electric and pneumatic installation, \$95,000; machine tools, traveling cranes and lifts, with installation of new machine shop, \$535,000. The expenditure of this amount will necessarily extend over the next twelve months, the purchase and installation of the outfit proceeding as buildings and floor space are prepared.

TRADE NEWS.

The Garton-Daniels Electric company of Keokuk, Iowa, has just appointed Mayer & England of 10 South Tenth street, Philadelphia, its representatives in the middle states territory for its line of railway lightning arresters.

A recent fire forced the removal of the Hartley Electrical Works of Chicago to 53 South Jefferson street. Bernard Hartley says that he has now more space and better facilities than before, and is in position to fill all orders for new or repair work promptly.

Mr. W. N. Matthews, formerly with the St. Louis Electrical Supply company, has undertaken the sale of a large amount of second-hand machinery, wire, shafting, pulleys and general supplies for one of the electric-lighting companies of St. Louis. He will be pleased to answer inquiries addressed to him at 312 Commercial Building, St. Louis.

The management of the Technical Agency, 1365 Monadnock Block, Chicago, states that for a month past it has been crowded with requisitions for draughtsmen, salesmen, electrical engineers and men for almost every class of engineering work. The agency's system for keeping in touch with a large number of the available technical men of the country has enabled it to supply the majority of these requisitions promptly and satisfactorily to both employer and employed.

On the morning of February 23d Roth Bros. & Co. of Chicago sustained a severe fire loss, their manufacturing plant being entirely destroyed. They will, however, resume business at once in a new location, which they are unable to name at present. Within a few weeks they will be ready to accept orders and make prompt shipments as usual. Their temporary address is 236½ East Madison street. Many friends and customers of this enterprising firm will extend sympathy in this misfortune.

All students of the Electrical Engineer Institute of Correspondence Instruction, as well as others connected with the electrical profession, will be interested to learn that this enterprising institution has secured the services of Mr. Alfred E. Wiener, the well-known author and electrical engineer, who assumes charge of the instruction department as chief instructor of the institute. Mr. Wiener is an exceptionally well-informed engineer and also possesses the rare gift of imparting knowledge to others. The students of the institute will be greatly benefited by this arrangement. Among the corps of authors and instructors which the institute has gathered around it are now numbered many of the most prominent electrical engineers of the country, so that the student enters upon his studies with the satisfying conviction of having intrusted his electrical education to an institution the good faith, trustworthiness and technical reliability of which stand unquestioned. Students and those who are desirous of becoming such are cordially invited to call at or write to the home offices of the institute, 120 Liberty street, New York city, where Mr. Herman A. Strauss, the general manager, will be at all times pleased to discuss or correspond in detail with them as to their individual needs and assist them in selecting the most suitable course.

BUSINESS.

The Electric Appliance company has thoroughly established in its new quarters, and a tour of its new building proves conclusively its superior facilities for successfully handling a large electrical supply business.

The American Electrical Heater company of Detroit is manufacturing an electric soldering iron especially suited for telephone work. These irons are already in use among switchboard manufacturers and by telephone exchanges in all parts of the country, and are stated to be giving excellent satisfaction.

Charles A. Cooper & Co. of St. Louis are doing a large and increasing business, and desire to call special attention to the Imperial double-fluorant incandescent lamp, which is meeting with considerable success at their hands. They are also offering a special four candle power sign lamp which consumes only 16 watts. Their fan motors and ceiling fans are said to be the "coldest members" in the land, and it is claimed that their lines of electrical supplies are the most complete in the West.

The Western Electrical Supply company of St. Louis, Mo., through its engineering department, reports the outlook for a large spring business as most encouraging. The numerous Warren alternating-current machines which this company has sold during the last season are more than pleasing to customers, and henceforth the company expects a rapid increase in its business in this line. It is now busy working on several large contracts for Warren alternating equipment. The Western Electrical Supply company believes that prospective purchasers of electrical machinery will consult their best interest by communicating with it before purchasing elsewhere.

The Warren Electric Manufacturing company of Sandusky, Ohio, did a large business through the month of January. During February it also secured many contracts. Among the more important ones were the following: One hundred and twenty kilowatts at Reno, Nevada; 30 kilowatts at San Francisco, Cal.; 75 kilowatts at Spokane, Wash.; 75 kilowatts at Torreon, Mexico; 120 kilowatts, Chambersburg, Pa.; 60 kilowatts, Woodfield, Ohio; 60 kilowatts, Rockford, Ohio; 75 kilowatts, Wallaceburg, Ontario; 30 kilowatts, Royal Oak, Mich.; 75 kilowatts, Holly, Mich.; 180 kilowatts, Denison, Texas; 120 kilowatts, Bonham, Texas; 45 kilowatts, Hillsboro, Tex. With the large amount of prospective business that is sure to fall to this active company within the next few weeks, the factory will keep up its operation with night and day force probably during the entire year.

The Shelby Electric company of Shelby, Ohio, manufacturer of the well-known Shelby and Y-ray incandescent lamps, has opened a permanent office in New York city in the Fidelity and Casualty building 97-103 Cedar street, with Mr. John F. Outwater in charge. Mr. Outwater's numerous friends in the trade will no doubt be surprised to learn that he has made the change from buyer to seller. For the past ten years Mr. Outwater has been connected with the Brooklyn Edison company, in various responsible positions, lately as purchasing agent, and the numerous friends whom he has made as a buyer will no doubt be glad to reciprocate when in position to do so, now that he is on the other side of the counter. Mr. Outwater states that he is in position to furnish the trade with any and all types of lamps, ranging from 1-5 to 50 candle power, and from two to 250 volts.

Users of belts will be interested in the claims of the Crescent Chemical company, sole manufacturer of "never-slip" pulley covering, 185 Dearborn street, Chicago. This company makes strong claims for its pulley covering, which is said to be used in thousands of plants throughout the country. By the use of this product machinery may be run with sagging belts and cool journals without the use of idlers or tighteners, saving lost motion, requiring less power and only about half the amount of oil. It is also said to increase the life of belts and machinery one-third. The special claim made for the pulley covering is that by its use belts will not slip. The pulley covering, which is a liquid, is applied with a brush and is always ready for use. It is guaranteed. The Crescent company is ready to send samples on 30-day tests. The company takes pride in showing its hundreds of testimonials. Many of these are from prominent electric-lighting companies.

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued February 21, 1899.

619,733. Electric Meter. Thomas Duncan, Fort Wayne, Ind. Application filed May 16, 1898.

In an electric meter there is the combination of the series energizing coil, the U-shaped iron core, the secondary energizing coil, the shunted energizing coil and the revoluble disk armature.

619,734. Electric Meter. Thomas Duncan, Fort Wayne, Ind. Application filed June 2, 1898.

In a retarding device the combination is described of a winged fan, a liquid opposing the revolutions or motion of the winged fan and consisting of pure paraffin oil, a detachable receiver having a screw-threaded joint for securing it

to a suitable support and containing the winged fan and paraffin oil, and a combination cover and support.

619,735. Multiple-rate Electric Meter. Thomas Duncan, Fort Wayne, Ind. Application filed June 11, 1898.

In the operation of the registering mechanism there are employed a right-hand worm, a right-hand worm wheel, a left-hand worm, a left-hand worm wheel, a movable lever carrying the right and left hand worm wheels and means for meshing separately either the right-hand worm wheel with the right-hand worm or the left-hand worm wheel with the left-hand worm.

619,700. Electrical Apparatus. Thomas B. Kinraid, Boston, Mass. Application filed May 5, 1898.

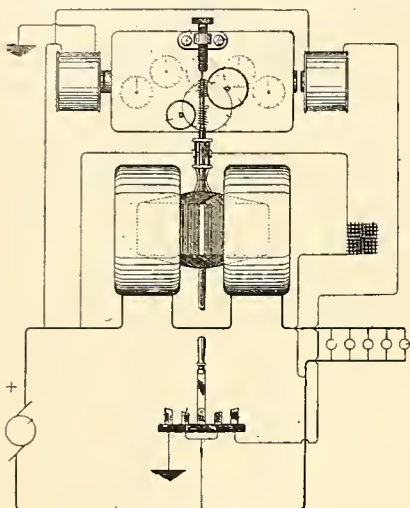
Claim is made for a body producing a magnetic field, a winding within the influence of the body, means to maintain high-potential and low-potential regions respectively in opposite parts of the magnetic field and means to cause fluctuations of the field, the winding being wound to present conditions of electrical potential related inversely to the magnetic potential of the field, and having decreasing potential throughout its entire length from its high-potential region to its low-potential region.

- 619,761. Dynamo-electric Machine. Thomas B. Kinraide, Boston, Mass. Application filed September 29, 1898.

An electromagnet is employed for producing a magnetic field, and means are provided for polarizing or converging the lines of magnetic force of the magnet from a large area thereof to a smaller area or pole, these means including a winding spread out co-extensively with the large area and immediately adjacent to the surface of the magnet.

- 619,771. Secondary Electric Clock. James O. Lyman, Waterbury, Conn. Application filed August 10, 1898.

An electric-clock movement is described comprising a plate provided with means for attachment to the cooperating parts of the movement, a pair of magnets, a forked lever, having attached to one end an armature and having one branch of its other forked end bent in the form of a V, the other branch thereof being bent at right angles near its extremity and provided with a set screw, a detent having one end thereof formed to engage the teeth of a main wheel, its outer end opposite end being so formed as to engage the end of a lever, a pawl pivoted to a lever and having one end formed to engage the teeth of the main wheel, the other end thereof being formed to engage a pin, a main wheel provided with cogs or teeth around its outer circumference, and a spring provided with means of attachment to a lever and a plate.



NO. 619,735.

- 619,829. Protective Device for Incandescent Electric Lamps. Richard Kaes, Vienna, Austria-Hungary. Application filed August 11, 1898.

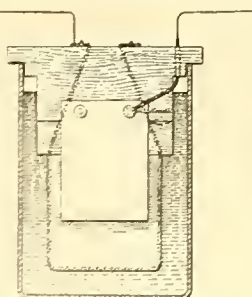
This is a protective cover for an electric lamp, to which is attached a supporting device adapted to be depressed by the fracture or depression of the cover, while a circuit making and breaking device is operated by a part or attachment of the supporting device, whereby the depression of the supporting device will break the circuit.

- 619,868. Coin Controlled and Registering Telephone Apparatus. Robert D. Cranston and Sylvester M. Williams, San Francisco, Cal. Application filed November 11, 1897.

A coin-controlled telephone apparatus, including a normally locked mechanism, means whereby it is released by a current from a central station to open a circuit, and a coin-controlled means for restoring the broken circuit.

- 619,885. Voltaic Battery. Hugh de C. Hamilton, New York, N. Y. Application filed March 17, 1896.

A hanger of insulating material comprising a bridge is adapted to rest on the top of a cell or jar, with an elongated or oblong extension underneath the bridge and having substantially parallel vertical sides, against which anode plates may be secured, an elongated flange below the extension, the flange being thicker than the extension and being located centrally longitudinally with respect thereto and adapted to form an abutment for the depolarizer carrier or plate, and two vertically disposed perforations in the hanger for receiving a bladder or fastener for the depolarizer, whereby short-circuiting through collecting escaped depolarizing material will be avoided.



NO. 619,845.

- 619,866. Railway-signal System. Thaddeus B. Keeler, Rahway, N. J. Application filed July 21, 1898.

Electromagnets of different resistances and a source of electric energy common to the electromagnets are included in the track circuit, independent signal circuits, signal operating means and a source of electric energy are included in each of the signal circuits, the armatures of the electromagnets being of different resistances, each forming a part of one of the signal circuits.

- 619,866. Insulating Caster. Harry S. Lee, Tecumseh, Mich. Application filed December 27, 1898.

The caster has opposite openings formed in the fork thereof, and a cross or other electrically non-conducting member, while an approximately U-shaped bail is

formed from a single length of wire, having the free ends of its side arms bent inward forming pivots, adapted to be engaged with the respective openings in the forks of the caster, whereby the bail is pivotally mounted upon the caster and embraces the caster wheel.

- 619,900. Electric Switch. Andrew H. Miller, Central City, Colo. Application filed (month omitted from official report) 9, 1897.

A switch for controlling two electric-lamp circuits, comprising a switchboard, contacts thereon, switch arms for closing the circuit through the contacts, lamp circuits leading from the contacts, and a link connection between the switch arms, consisting of a bar having a pivotal connection with one of the switch arms and a sliding engagement with the other of the switch arms.

- 619,927. Electric-railway Trolley. Edward M. Bentley, New York, N. Y. Application filed May 16, 1896.

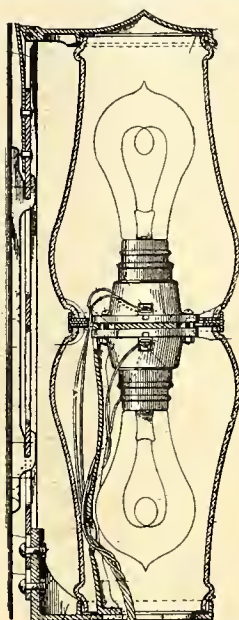
The combination is described with a pivoted trolley arm and a spring pressing the outer end of the arm upward, of a transverse guide on which the arm may travel and a similar transverse guide for the outer end of the spring.

- 619,942. Annunciator for Telephone Exchanges. William R. Cole, Detroit, Mich. Application filed August 25, 1897.

In an annunciator there is the combination of a movable signal wing, means for moving the wing into view, two axially aligned electromagnets in rear of the wing, a latch located between the wing and the first magnet for holding the wing in its normally retracted position and controlled by the first magnet, an armature for the other magnet and in rear thereof, and means actuated by the armature for returning the signal wing to its normal position.

- 619,965. Route-indicating Lamp for Street Cars. James A. Lakin, Westfield, Mass. Application filed April 19, 1898.

This device consists of a frame plate, a vertically adjustable base secured to the lower end of the plate, an arm on the base, incandescent electric-lamp sockets secured on the arm, a globe cap pivotally secured to the top of the frame plate, globes supported between the cap and the base, a spring on the frame plate engaging the cap for holding it against the globes, and a cushioned globe-pivoting ring between the adjoining ends of the globes.



NO. 619,965.

- 619,974. Rail Insulator. Charles B. Martin, New York, N. Y. Application filed November 8, 1898.

In a third-rail electric-railway system, it is proposed to use contact rail and insulators therefor comprising supports attached to the cross ties, and insulating bodies interposed between the contact rail and the support and supporting the contact rail loosely, to allow the cross tie and attached supports to move vertically relatively to the contact rail, but prevent lateral movement of the rail.

- 620,002. Switchboard-connecting Cord Circuit. George K. Thompson, Malden, Mass. Application filed July 16, 1898.

A cord circuit for linking together sub-station circuits of diverse character divided by a repeating coil into two independent plug circuits, each plug having three contact surfaces, the tip and sleeve being in circuit with each other and normally including in series two helices of the coil, a condenser, and a disconnecting signal and the test-contact surface being in circuit with a relay and battery, whereby when the plugs are inserted into sub-station circuits of the same or of dissimilar type, each plug circuit is adapted to repeat into the other.

- 620,004. Telephone-switchboard Circuit. Thomas C. Wales, Jr., Newton, Mass. Application filed October 31, 1898.

A special cord circuit is provided with one plug only, normally resting in a grounding plug-seat switch, the line-conductor terminals of the plug being in series with each other and with a retardation coil; a battery and a relay, and the test-conductor terminal of the plug being in series with each other and with a retardation coil, a battery and a relay and the test-conductor terminal of the plug being in series with a second relay and a battery, the battery having two normally open independent branches to the plug-seat switch, each having in series a supervisory signal and a resistance coil, the respective armatures of the relays being each adapted to short-circuit one of the signals.

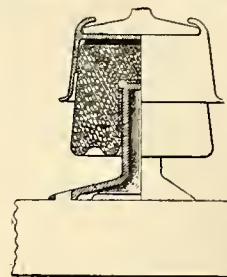
- 620,009. Electric Railway. William R. Woodward, New York, N. Y., and Frederick S. Woodward, Graniteville, Mo. Application filed March 29, 1898.

In an electric-railway system there is the combination with a main conductor and a series of stationary insulated

third-rail sections, of switches controlling the connection between such sections and the main conductor, mechanical operating devices located beyond each end of each section and reversely connected to such switches, and an electrically propelled vehicle having means for taking current from the third-rail sections and provided with means such as a shoe for engaging with the switch-operating devices, to close the switch before the vehicle passes onto the section from either direction, and to open the section after the vehicle passes off of the section in either direction.

- 620,027. Induction Coil. Manes E. Fuld, Baltimore, Md. Application filed December 7, 1898.

An induction coil has insulated iron wrapped upon the bobbin tube and the primary and secondary coils wound upon the insulated iron.



NO. 618,974.

- 620,031. Constructing and Bonding Rails of Electric Railways. Samuel H. Harrington, New York, N. Y. Application filed June 17, 1897. Renewed July 18, 1898.

A rail for electric railways having a heading of the same metal as the rail extending out from and incorporated with it and a bond-receiving perforation formed through the heading and the adjacent metal of the rail proper.

- 620,042. Telephone-call Register. Bruno Krausse, Wilmersdorf, Germany. Application filed August 1, 1898.

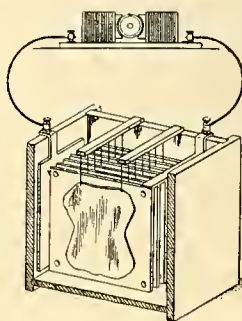
One claim is given: In a telephone system, a registering device, a device for normally locking the same, an electrically operated releasing mechanism for said locking device, electric generators, such as batteries located at the subscribers' stations, and current-switching devices in connection with said batteries and with the releasing mechanism, said current-switching devices being controlled by the establishment and interruption of the speaking circuit and serving to normally connect like poles of said batteries so as to render the batteries inactive, while the establishment of connections for conversation will so affect the current-switching devices as to change the connection of the batteries and send an operating current into the releasing mechanism, and mechanism for operating the locking device at the end of a conversation.

- 620,056. Process of Tanning Hides or Skins. Samuel P. Sadler, Philadelphia, Pa. Application filed October 21, 1897.

The method described of tanning or tawing hides or skins consists in impregnating the hides or skins with a metallic salt which is capable of yielding, under the action of hydrogen, a metal, metallic oxide or compound, which will unite with the fiber of the hide to form leather, and then subjecting the hides or skins to the reducing action of nascent hydrogen electrolytically produced.

- 620,086. Electric Heater. Louis Casper, Chicago, Ill. Application filed November 15, 1897.

In an electric heating device there is the combination of a fluid chamber, a heating chamber arranged within the fluid chamber to provide a surrounding space, insulated supports in the heating chamber, a series of resistance rods mounted in the supports, coupling conductors connecting the rods at opposite end portions in convoluted series, a removable cover closing the outer end of the heating chamber, electric circuit posts on the cover, and fingers on the first and last rods in contact with the posts.



NO. 620,056.

REISSUES.

- 11,718. Electrical Controlling Apparatus. Oscar H. Pieper and Alphonse F. Pieper, Rochester, N. Y. Application filed January 17, 1899. Original No. 575,573, dated January 19, 1897.

The last claim is reproduced: In an electric controlling apparatus, an oscillating spindle, a fixed switch bar on said spindle, connected brushes and an insulated brush on said switch bar, a series of contact plates surrounding the spindle, and a lever for operating the spindle, so that when the lever is approaching its central or neutral position the field magnets remain at full strength.

- 11,719. Telephone. John T. Gent, Alwyn W. Staveley and Isaac H. Parsons, Leicester, England. Application filed October 26, 1897. Original No. 584,868, dated June 22, 1897.

In a telephone there is the combination with the diaphragm of a variable resistance device consisting of suitable conducting material in a granulated or comminuted state, a movable containing or holding receptacle for the material, and means connecting the receptacle with a normal movable instrumentality of the telephone apparatus, whereby the receptacle is automatically actuated whenever the instrumentality is operated in effectuating the service of the telephone.

LEADERS IN THE INDEPENDENT



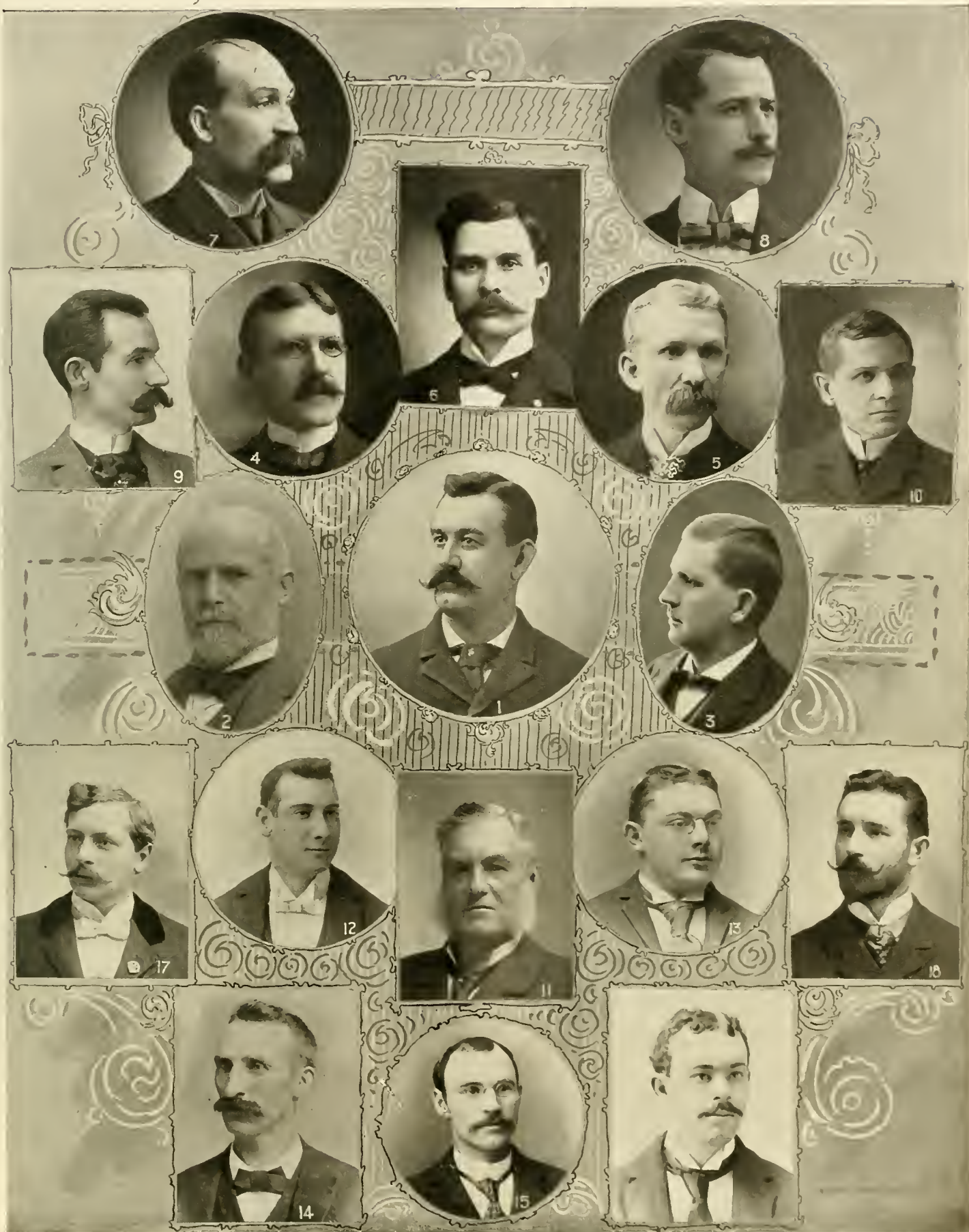
Western Electrician

1. Milo G Keilogg, President Kellogg Switchboard and Supply Company, Chicago.
2. James E. Keelyn, President Western Telephone Construction Company, Chicago.
3. H. C. Dodge, General Superintendent Western Telephone Construction Company, Chicago.
4. J. G. Nolan, General Sales Agent Western Telephone Construction Company, Chicago.
5. P. C. Barry, President American Electric Telephone Company, Chicago.
6. S. W. Moon, General Manager American Electric Telephone Company, Chicago.

7. W. O. Meissner, General Superintendent American Electric Telephone Company, Chicago.
8. J. G. Ihmsen, Manager Keystone Electric Telephone Company, Pittsburg.
9. S. H. Couch, Whitman & Couch, Boston.
10. R. L. Whitman, Whitman & Couch, Boston.
11. W. E. Sundberg, General Manager Reliable Electric Manufacturing Company, Worcester.
12. C. H. North, President North Electric Company, Cleveland.

13. E. E. Yaxley, Superintendent and Electrical Engineer Victor Telephone Manufacturing Company, Chicago.
14. F. J. Dowland, President Mason Telephone Paystation Company, Ludington, Mich.
15. E. S. Taber, Treasurer Taber & Mayer Company, Boston.
16. J. A. Williams, President Williams Electric Company, Cleveland.
17. W. J. Murdock, W. J. Murdock & Co., Boston.
18. E. E. Ries, President United States Automatic Telephone Company, New York.

NT TELEPHONE MOVEMENT.



1. J. M. Thomas, President Independent Telephone Association, Chillicothe, Ohio.
2. S. P. Sheerin, General Manager New Telephone Company, Indianapolis.
3. G. W. Beers, President National Telephone and Telegraph Company, Fort Wayne, Ind.
4. W. E. Doolittle, General Manager Sterling Electric Company, Chicago.
5. F. B. Cook, Chief Engineer Sterling Electric Company, Chicago.
6. A. Stromberg, President Stromberg-Carlson Telephone Manufacturing Company, Chicago.

7. A. Carlson, Vice-president Stromberg-Carlson Telephone Manufacturing Company, Chicago.
8. Henry Shafer, Secretary and Treasurer Municipal Police Signal Company, Chicago.
9. J. J. Nate, General Manager Standard Telephone and Electric Company, Madison.
10. C. W. Farr, President Farr Telephone and Construction Supply Company, Chicago.
11. A. G. Davis, President Viaduct Manufacturing Company, Baltimore.
12. I. J. Kusel, President Eureka Electric Company, Chicago.

13. Arthur Stein, Secretary and Treasurer Eureka Electric Company, Chicago.
14. A. M. Taylor, Butler-Taylor Company, Ravenna, Ohio.
15. F. A. Lundquist, Superintendent National Automatic Telephone Company, Chicago.
16. J. S. Cuming, President Central Telephone and Electric Company, St. Louis.
17. Lamber Schmidt, Schmidt & Bruckner Electric Company, New York.
18. Frederick C. Bruckner, Schmidt & Bruckner Electric Company, New York.

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4. W. E. Doolittle, General Manager Sterling Electric Company, Chicago.
5. F. B. Cook, Chief Engineer Sterling Electric Company, Chicago.
6. A. Stromberg, President Stromberg-Carlson Telephone Manufacturing Company, Chicago.

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Western Electrician

EVERY SATURDAY.

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CHICAGO, MARCH 11, 1899.

No. 10

Hopkins J. Hanford.

The subject of this sketch has been introduced to electrical interests through his connection with the independent telephone industry, in which he has been a conspicuous figure for several years. Hopkins J. Hanford is not an electrical engineer, and he makes no pretensions to scientific attainments. Without the advantage of technical training, he has succeeded in building up an admirable system, and the secret of his success lies in his willingness to leave all technical matters to the men he employs to design, build and operate his exchanges, devoting his entire attention to the management of the property. He is a business man, and he has introduced business methods in all the independent telephone enterprises with which he has been identified.

The first work of this character in which Mr. Hanford engaged was in Ohio, 15 years ago. A small town in which he was interested, because it was the home of his childhood, desired a telephone service, but could not satisfy the exorbitant demands of the old company. Mr. Hanford accordingly started out to build an independent exchange, and he succeeded so well that he determined to build another.

This was a small undertaking, viewed in the light of present experience, but at the time of its inception it was regarded as a big enterprise, and it involved considerable risk.

However, the field was not ripe for the general establishment of anti-Bell exchanges, and Mr. Hanford devoted his attention to other matters. He has built railroads, reclaimed waste lands, executed government contracts and engaged in the government service since then, thus enjoying an exceptionally wide experience and gaining valuable acquaintance among public men, capitalists and promoters. Mr. Hanford was connected with the United States Treasury Department for several years as chief of the inspectors of national banks. Upon his retirement from this position he engaged in banking in New York city.

About the time of the expiration of the Bell patents Mr. Hanford's business called him to Detroit, where he found great dissatisfaction everywhere manifested against the old monopoly. Seizing the opportunity thus afforded, Mr. Hanford offered to organize a company and build an exchange if a favorable franchise could be secured. This was done, and the work of establishing a competing telephone system in Detroit was at once launched. Mr. Hanford procured the necessary financial backing, but he was not able to make the arrangements he desired for the equipment of the exchange, and he proceeded to form a construction company to take up the work. A switchboard was built and the exchange was soon in running order, forming one of the largest and most successful independent telephone exchanges in the country.

Mr. Hanford's greatest achievement was the formation and exploitation of the Kinloch Telephone company at St. Louis. He was the organizer, financier, builder and operator of this exchange, which is to-day unquestionably the most successful anti-Bell enterprise in the country. At present it is giving regular commercial service to 5,000 paid subscribers, which largely exceeds the entire list of Bell patrons in St. Louis. The company is still busily engaged in adding new patrons and extending lines in all directions. An addition to the exchange equipment that will give it capacity for more than 8,000 connections is now being built.

Mr. Hanford is also general manager of the St. Louis Electric Construction company and he holds the same office in the Citizens' Electric Lighting and Power company of St. Louis.

At present Mr. Hanford is giving considerable time to the affairs of the Illinois Telephone and Telegraph company, which has just received a franchise from the city of Chicago for an independent telephone exchange, to compete with the old Bell system. It will therefore be seen that Mr. Hanford represents large interests in the independent telephone industry, and that he is bound to play a conspicuous part in the development of that field.

Mr. Hanford is a resident of Evanston, Chicago's fashionable North Shore suburb.

Independent Telephone System for Chicago.

The preliminaries in the formation of the Illinois Telephone and Telegraph company are now being completed; the selection of directors and officers and the settlement of the policy of the company are being made. Charles H. Aldrich, the legal adviser of the promoters, is authority for the statement that some of the most prominent business men of Chicago are identified with the project and that the directory when announced will be thoroughly satisfactory to the people.

Mayor Harrison formally approved the ordinance passed by the Chicago City Council granting the company a franchise for a telephone-exchange system in this city. The new concern starts with friendly interest of the city administration as well as the public generally. Actual work upon the plans for the exchange and in canvassing for subscribers



HOPKINS J. HANFORD.

will be begun as soon as the formal organization is perfected.

Independent Telephone Interests in Cleveland.

The Cuyahoga Telephone company, which was recently organized, has purchased the franchise and plant of the Home Telephone company of Cleveland, an independent organization, and has entered into very extensive plans for the construction during this season of an exchange, at Cleveland, of very large size and on the most approved lines of construction.

The company is composed of men of large financial means, who are also largely interested in street railroads and other interests in Cleveland. Mr. H. A. Everett is the president of the company, and the interest is practically the same as that locally known as the Everett syndicate.

The company has contracted with the Kellogg Switchboard and Supply company of Chicago for its switchboard and telephone apparatus, and the system will be in complete operation before the end of the year. The switchboard will have a capacity, when installed, for 5,760 lines, and its ultimate capacity will be about 20,000 lines.

The Everett syndicate is now constructing an

eight-story, fireproof building in Cleveland for the use of its telephone exchange and street-railroad interests. The upper floor of the building will be devoted entirely to the switchboard plant, and will be of the size to allow a switchboard for the ultimate capacity of 20,000 lines.

The same interest will also construct, during the coming season, a very extensive system of toll lines throughout Ohio, to be known as the United States Telephone company of Cleveland. The officers of this corporation are the following-named gentlemen: President, H. A. Everett; vice-president, E. W. Moore; secretary, James B. Hoge; treasurer, John Sherwin; superintendent, Fred Storm; counsel, H. D. Chitchfield; consulting engineers, Ledlie & Reber.

Independent Telephony in New England.

[From the Boston correspondent of the WESTERN ELECTRICIAN.]

The plans of the promoters of the Massachusetts Telephone and Telegraph company are beginning to emerge from the obscurity which enveloped them when the company first brought forward its propositions. It is conceded by the people interested, represented by Z. S. Holbrook of Cambridge, Mass., that they contemplate establishing a long-distance line for New England, and it may eventually reach out beyond New York and Philadelphia, which are their present objective points outside of this section.

Since they obtained franchises in Boston, and applied for a charter under the name of the New York and Boston Telephone company in New Jersey, the promoters have obtained a franchise in Portland, Me., and control rights to build and operate lines in other parts of the state of Maine. Early in the present month they applied in Connecticut for a charter to do business in that state also. Their latest move is an application for a franchise in Providence, R. I. With large independent exchanges in Boston, New York, Philadelphia and many of the other important cities en route between Portland and Philadelphia, they expect to do a rushing business.

Haverhill, which has a fight on hand between an independent company and the New England Telephone and Telegraph company, might be utilized as a connecting link on the way to Portland from Boston, while Providence and New Haven would come in handy on the road to New York. Worcester and Springfield are also said to be objective points.

President Charles E. Adams of the Massachusetts State Board of Trade has accepted the presidency of the company. He is a Lowell man.

In Boston and in Providence the company's representatives, in asking for special privileges, have pledged themselves not to sell out to any other corporation. It is believed that the enterprise is a legitimate one, and means business, with millions ready to be invested whenever they are wanted and called for.

The New England Telephone and Telegraph company, the Bell institution here, is aroused to effort to forestall the newcomer in this city, and is said to have sent out 50 canvassers during the last month to obtain new subscribers in the local and suburban districts.

Independent System for Columbus.

The Ohio Telephone company has applied to the Columbus City Council for a franchise. The terms offered by the new company provide for a rental of \$2 per month for residence telephones and \$36 per year for business telephones, with full metallic circuit; or, with long-distance equipment, \$5 per month for residences and \$48 per year for business houses and offices "at any place within the present or future corporation lines of the city." Should the lines be required to go underground after five years, an increase of the rentals may be made, not to exceed \$1 per month per instrument. The company agrees to pay the city two per cent. on the first \$50,000 of its gross receipts, with a sliding scale.

The proposition has been received with general favor, and it is anticipated that the franchise will be granted.

Independent Toll-line Service in Michigan.

By W. C. STERLING, JR.

Michigan has gained distinction in the independent telephone field, not only on account of its successful anti-Bell exchanges in large places, but particularly through the network of toll lines that covers the state and connect the independent exchanges in large and small points.

The New State Telephone company of Michigan is said to be the largest independent telephone system in this country. It was organized immediately after the Detroit Telephone company began business and has rapidly enlarged and extended its system until it now owns its own lines across the state and has established exchanges in all cities within a radius of 150 miles from Detroit.

W. L. Holmes is president of both the Detroit Telephone company and New State Telephone company, and the directors of both companies include A. I. McLeod, E. H. Parker, Charles Flowers, T. F. Ahern, Hugh O'Connor, W. C. Sterling, Jr., John T. Holmes and the president. Mr. Hart of Lapeer is a director in the New State Telephone company and Julius Stroh of the Detroit Telephone company.

The New State Telephone company is strong, because it has been established on a popular basis. All the stock is held in Michigan and is distributed wherever the lines extend. Enough stock is usually sold in each city in which an exchange is to be established to build the exchange. In this way the com-

panies working, with which the New State Telephone company connects.

There are over 26,000 independent telephones in Michigan, and these two companies operate nearly 10,000 of them through their exchanges and 150 toll stations.

From all appearances the Michigan (Bell) Telephone company made a failure in its efforts to crush the New State Telephone company, and finally sold out a controlling interest to the Erie Telegraph and Telephone company, but the reorganized company has made no advance toward regaining the confidence of the people of the state.

The New State Telephone company's largest exchanges are located at Jackson, Ann Arbor, Mount Clemens, Port Huron, Monroe, Ypsilanti, Pontiac, Howell, St. Clair, Lapeer, Rochester, Flushing and Marine City. The company has toll connections with Grand Rapids, Bay City, Saginaw, Lansing, Kalamazoo, Battle Creek and many other important cities of Michigan.

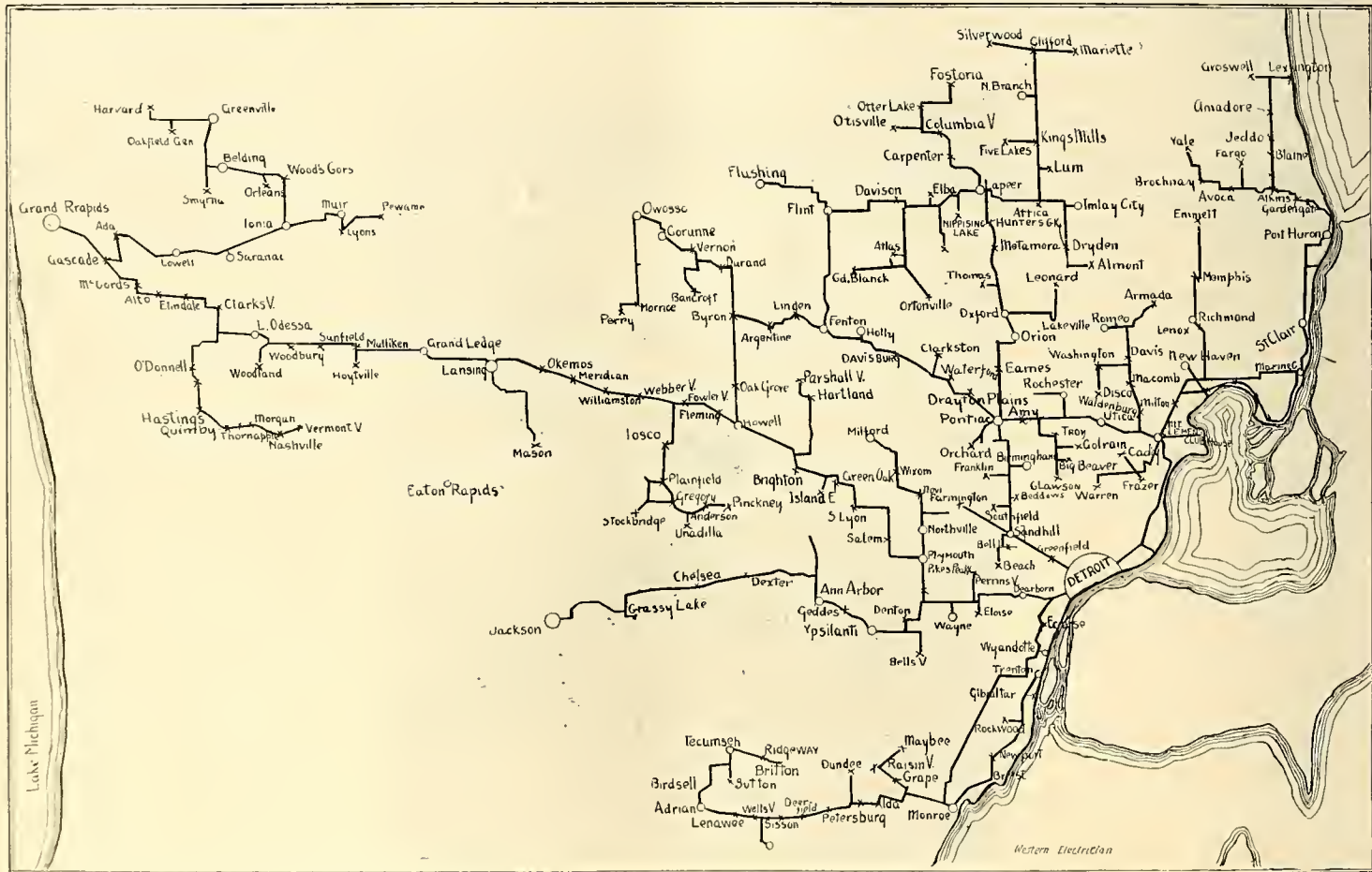
The company makes its own equipment, including long-distance telephones and the latest drop and signal multiple switchboards. Its long-distance toll lines are copper wires throughout, and the construction has been planned with a view of making the system a permanent investment.

Lower Rates for New York Telephones.

[From the New York Tribune.]

It can hardly be doubted that a great majority of the users of telephones believe that the charges in

while they aim to secure some relief for the public. They are not working in favor of an arbitrary-rate bill, nor do they wish to cut down the profits of the companies to an extent which will bring serious trouble upon the systems now in use; but this bill, while it fixes rates, provides a simple means of changing them to higher or lower figures if these rates are found on trial to be unjust to the companies or to the public. It is proposed that three state officers shall act as arbitrators, and that these arbitrators shall investigate the complaints of subscribers if prices are too high and the complaints of the companies if prices are too low. No investigation expenses are to be paid by the state. This plan requires that the companies shall have an opportunity to pay profits of 10 per cent. upon the actual investments in addition to the interest upon bonded indebtedness. Might it not be prudent and wise for the telephone companies to abandon opposition to this Marshall-Henry bill lest a worse thing should befall them? It is certain that no bill which seeks to confiscate property or to take away from the companies an equitable rate of profit can obtain the sanction of the Legislature and the governor. The Merchants and Manufacturers' Board of Trade, which has been supporting a bill much more radical and revolutionary than the Marshall-Henry bill, has announced that it is willing in the public interest to withdraw the measure which it has been supporting, lest the Legislature might decline to afford any relief to the public if legislation too sweeping and drastic were demanded. No convincing arguments have been presented by the companies for their hostility



INDEPENDENT TOLL-LINE SERVICE IN MICHIGAN.—MAP OF NEW STATE TELEPHONE COMPANY'S SYSTEM.

pany has its local stockholders to stand by it if a hard fight is made by the Bell company. Moreover, a great many farmers in the territory through which the toll lines extend are stockholders. The company is free of bonded indebtedness and is paying two per cent. quarterly dividends. In some cities the Bell company has been almost entirely superseded. Monroe, Mich., may be cited as an example. The New State Telephone company has 200 telephones working, while the Bell company has about a dozen, and these are not all paying subscribers.

The large Jackson exchange of this company is almost completed. This will greatly assist the income-earning capacity of the toll lines.

The company has recently completed arrangements with all independent telephone companies of Michigan to connect their lines, and is now furnishing toll service to the Central Telephone company of Kalamazoo and the Citizens' Telephone company of Grand Rapids. By connecting with these two companies, points in Indiana and Ohio are reached by New State Telephone company subscribers. The Valley Telephone company of Saginaw connects on the north. The company is constantly improving and extending its system.

At present the New State Telephone company has about 1,500 telephones working and over 2,500 miles of telephone lines, and the Detroit Telephone company, the parent company, has over 5,000 tele-

this city are excessive. It is a matter of common knowledge that the profits of the parent company, whose main offices are in Boston, have been great for many years, and have now reached totals that are actually prodigious. New Yorkers who pay telephone bills are convinced as a rule that the gains of the local organizations are handsome, and that the management ought to be willing now to grant reductions. The growth of the telephone business on and about Manhattan Island has been remarkable, and there is a general feeling that the companies ought to be satisfied with more moderate rates than those which they are now exacting. It is not only the regular rentals of telephones with which fault is found, but also the condition of things by which the renter of a telephone in the borough of Manhattan is compelled to pay an extra charge whenever he calls up the renter of a telephone in Brooklyn or in the boroughs of Richmond and Queens. No person deserving attention desires to deprive the owners of the telephone patents and the telephone properties of a proper return on the capital actually invested; but some measure of relief from the present telephone schedules ought to be adopted by the Legislature.

The Marshall-Henry bill, which has been introduced at Albany again this session, appears to be discreet and judicious, and its supporters declare that they intend to do no injustice to the companies,

to a rational adjustment of rates. No public-spirited person who has considered the subject with care can dispute the evident fact that the present rates are too high, and that the users of the telephone are entitled to reasonable relief.

Telephoned for the Minister.

[From the Cleveland Plain Dealer.]

A local clergyman was downtown one of the recent ultra-zero mornings, and, desiring to call upon a parishioner whose place of business is on Water street, he stepped into the office of another parishioner on the avenue near Erie street, with the intention of calling up the Water street man by telephone and finding out how long he would be in his office, the pastor not relishing the idea of the long walk in the piercing cold.

The avenue parishioner was not in. His office-boy had the big room all to himself.

"My lad," said the pastor, "I wish you would call up Mr. Dash, main 'steen-naught, and ask how long he will be in his office, and if he isn't there find out when he will be in. My fingers are so cold I don't think I could hold the receiver."

"Yes, sir," said the polite boy. "Who shall I say wants to know?"

"Rcv. Mr. Blank," replied the pastor, as he drew up a chair beside the steam radiator.

Pretty soon he heard the boy say:
 "Is this main 'steen-naught?"
 There was a brief silence. Then the boy went on:
 "Yes, yes, I've got 'em—Iullo! Is the boss in?—
 what's that?—Who's this talking? Why, it's the
 Rev. Mr. Blank. No, Blank—Blank, Blank, Blank—

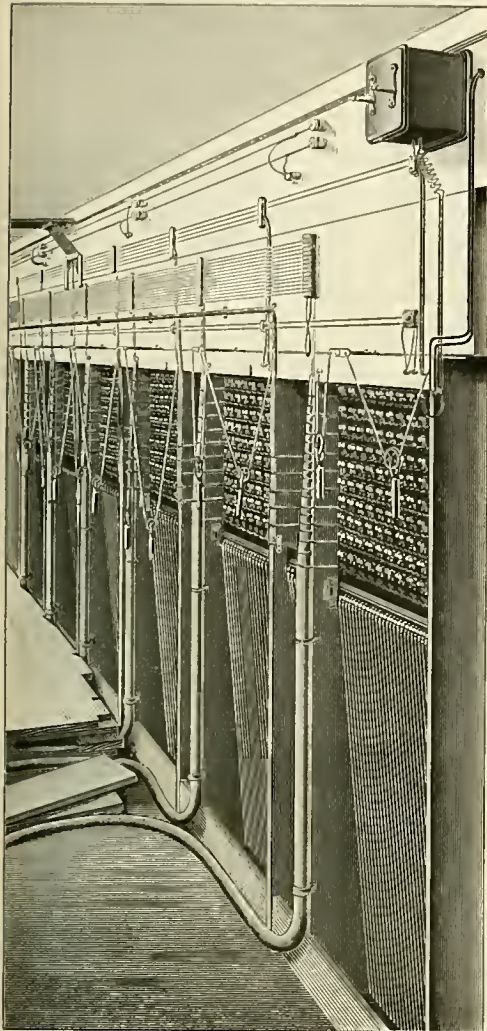


FIG. 2. AMERICAN EQUIPMENT FOR BRITISH COLUMBIA EXCHANGE—CONSTRUCTION OF SWITCHBOARD.

What's the matter with you, Lizzie? This is the Rev. Mister Blank! Got it? Don't get funny, girlie. What do I want to know? Say, I asked you that half an hour ago. Is the old man in? Who is it talking? Well, I'll be jiggered! Now, take off your earmuffs, Mabel, an' do a little listenin' act. This is the Rev. Mister Blank! Oh, you've got it now,

have you, birdie? So kind of you—yes, yes, I'll forgive you this once. Now agitate your Cinderellas into the old man's office an' see if he's there. Yes, tell him the Rev. Mister Blank is at the 'phone an' wants to know if he's out. Don't be idlin' round when there's souls to save. Get a hustle on you."

At this point the pastor got so fidgety that he walked over to the telephone.

"Just hold on a minute, my boy," he beseechingly cried.

But the boy waved him aside.

"I'm getting him," he said.

Then he turned back to the telephone.

"Who's this?" he cried. "Who? Mr. Bunner? I don't want you—yes, this is the Rev. Mister Blank. Blank, Blank. Who's swearing? Don't get fresh, Bunny. Yes, Rev. Mister Blank. Yes, Reverend. Preacher, you know; be good—go to church—Friday evenin' prayer-meetin's. Got it? Yes, this is him. Is old Dash in? There, don't get gay. What's that? Won't be back for three months? You ain't kiddin'?" Well, that's all. Yes, it's quite enough. Funny Bunny. By-by."

And the boy slammed the receiver into its hooks. Then he turned to the perspiring clergyman and deferentially remarked:

"Mr. Dash has just stepped out, sir, an' won't be back for three months!"

After this the worthy pastor will endeavor, whenever possible, to do his own telephoning.

American Equipment for British Columbia Exchange.

It will be a source of considerable gratification to independent telephone interests to learn that the principal exchange in British Columbia has been equipped throughout with apparatus manufactured and installed by an independent telephone company of this country, especially in view of the fact that the present equipment is to replace the Bell system originally installed. The Victoria and Esquimalt Telephone company has thoroughly rebuilt its lines and exchange plant and has now a capacity of 1,000 numbers. The change in construction and apparatus has greatly improved the service and added materially to the popularity of the company.

An excellent view of the switchboard in the company's central exchange at Victoria, B. C., is presented in Fig. 1. This equipment is the standard express switchboard of the American Electric Telephone company of Chicago and has capacity for 1,000 connections. Fig. 2 shows the back of several sections of the board, and gives a fair idea of the construction and wiring system employed. The cross-connection board is illustrated in Fig. 3.

The construction of the switchboard is along the lines followed in the standard equipment of this type, and can be enlarged at will without requiring any change in the plans of the system further than that immediately needed for the new business. The entire plant is laid out with the view of securing a thoroughly flexible system, that can be increased from time to time as the demands upon it require.

The special features of this type of board may be summarized as follows: Each drop and jack is mounted in a separate case. The back of the board consists of a series of hardwood strips extending horizontally across the board, and each strip is of the same width as the height of the shell from top to bottom. There are 10 of these wood strips to each section, and each strip is made for the insertion

of to drops. Along the front of each wood strip are run four strips of german silver. Two of these represent the generator circuits and two the night-alarm circuits. Four german-silver springs are mounted on the back of each of the drop cases. These represent the generator and night-alarm terminals of the drop. Extending out from back of each drop shell are also two substantial machine screws. In inserting these screws through holes bored in the wood strips the drop is brought into its proper position in the switchboard. The machine screws running through the board are provided with

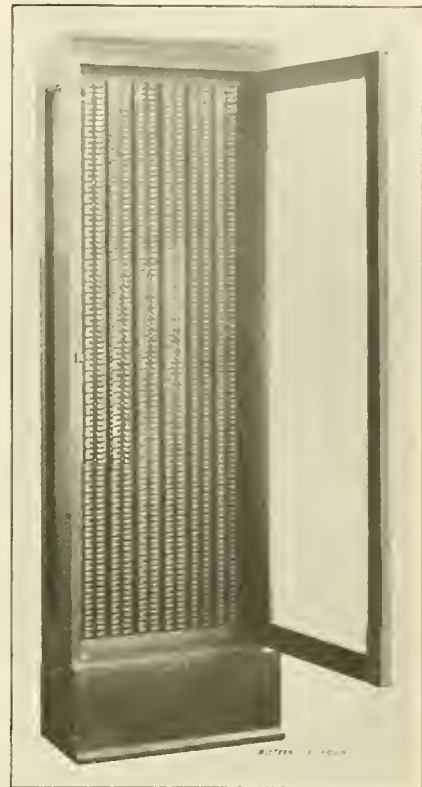


FIG. 3. AMERICAN EQUIPMENT FOR BRITISH COLUMBIA EXCHANGE.—CROSS-CONNECTION BOARD.

thumb-screws or nuts. When these nuts are tightened the drop is fastened securely in position in the frame, and at the same time connection is positively and reliably made between the german-silver bands or strips on the front of the wood strip on which the drop is mounted, and hence night-alarm and generator connections are made between drop and the strip circuits. Each 100-number section, whether equipped with full 100 drops or not, is wired for the full 100 lines, with operator's instruments mounted and all circuits run ready to connect the board to line terminals and be put into operation without inconvenience or delay.

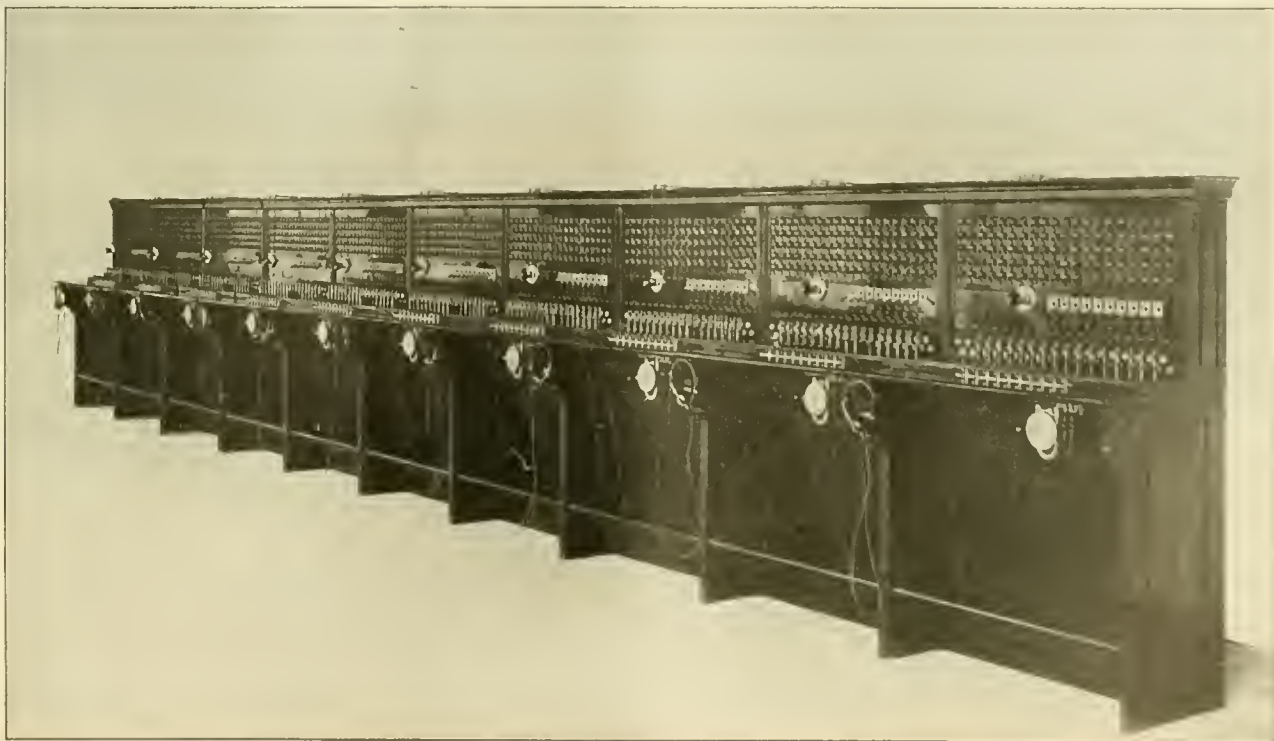


FIG. 1. AMERICAN EQUIPMENT FOR BRITISH COLUMBIA EXCHANGE.—1,000 LINE EXPRESS SWITCHBOARD OF VICTORIA AND ESQUIMALT TELEPHONE COMPANY AT VICTORIA, B. C.

Central-office System of the Newark Telephone Company.

The central-office system recently built and installed by the Western Telephone Construction company of Chicago, Ill., for the Newark Telephone company at Newark, N. J., includes a main exchange, arranged for an ultimate capacity for 2,100 subscribers, and four sub-offices—at Belmont, with 300 capacity; Belleville, 200; Roseville, 200, and Harrison, 100.

Referring to the cuts, Fig. 1 is a view of the main exchange, in which 17 operators are engaged at their respective stations, including the chief and trunking operator. Fig. 2 shows a back view of the switchboard. It will be observed that sliding doors completely protect the drop cases, connecting rack and wiring against the entrance of dust or other interfering agencies. At the far end of the switchboard the relay cabinet is shown, and at the right a part of the distributing board. Fig. 3 presents a view of the test side of the 2,100-capacity distributing board and a side view of the power board at the right. A back view of the distributing board showing the arrester side is presented in Fig. 4. The underground cables are equipped with tubular ter-

3. Lamp-signal circuits, 20 volts direct or alternating current.

4. Subscriber's calling circuit, 75 volts alternating current.

The operator's transmitter circuits are supplied with current by two cells of storage batteries of 300 ampere-hours capacity, one cell being charged while the other is delivering current to the transmitters. The same batteries are used for charging the relay circuits.

The lamp-signal circuit is normally supplied with current by the secondary winding of a motor-generator whose primary is wound for 500 volts direct current. As the signal current must be supplied at all times, even while the motor-generator is cut off, a set of 10-40 ampere-hour storage batteries is kept in readiness for instant use. As a matter of fact, the storage batteries are usually cut in during the night and Sunday service.

The subscriber's calling (power generator) circuit is supplied from the 20-volt secondary winding of the motor-generator, and the current is raised to 75 volts by means of a static transformer. In case of a breakdown an auxiliary motor-generator may be cut in. This machine has a 110-volt direct-current primary and a 75-volt alternating-current secondary.

ators, transmitters and receivers. In responding to a call (announced by the exposure of an annunciator shutter) the operator inserts an answering plug into the spring-jack, thus restoring the shutter, and inquires as to the caller's needs. If this be a request for connection with a subscriber's line within the operator's direct reach, the connection is completed without any additional operation other than that of inserting the calling plug into the desired subscriber's line-jack and projecting a calling signal over the circuit. In case the request had been for a connection with a subscriber's line outside of the operator's reach, although terminating in the same office, the Western multiple-plug system is employed. If, however, the circuit is required to be extended to either of the sub-exchanges, the calling plug is inserted into a transfer-jack terminating in a regular annunciator drop and spring-jack on the trunk board (shown by Fig. 1), and then by means of visual signals the main operator informs the trunk operator which sub-office the circuit should be connected with. The trunk operator complies with the request by selecting a plug whose circuit is permanently extended to the desired sub-office and inserts it into the spring-jack of the trunk selected by the main operator. This completes the connection be-

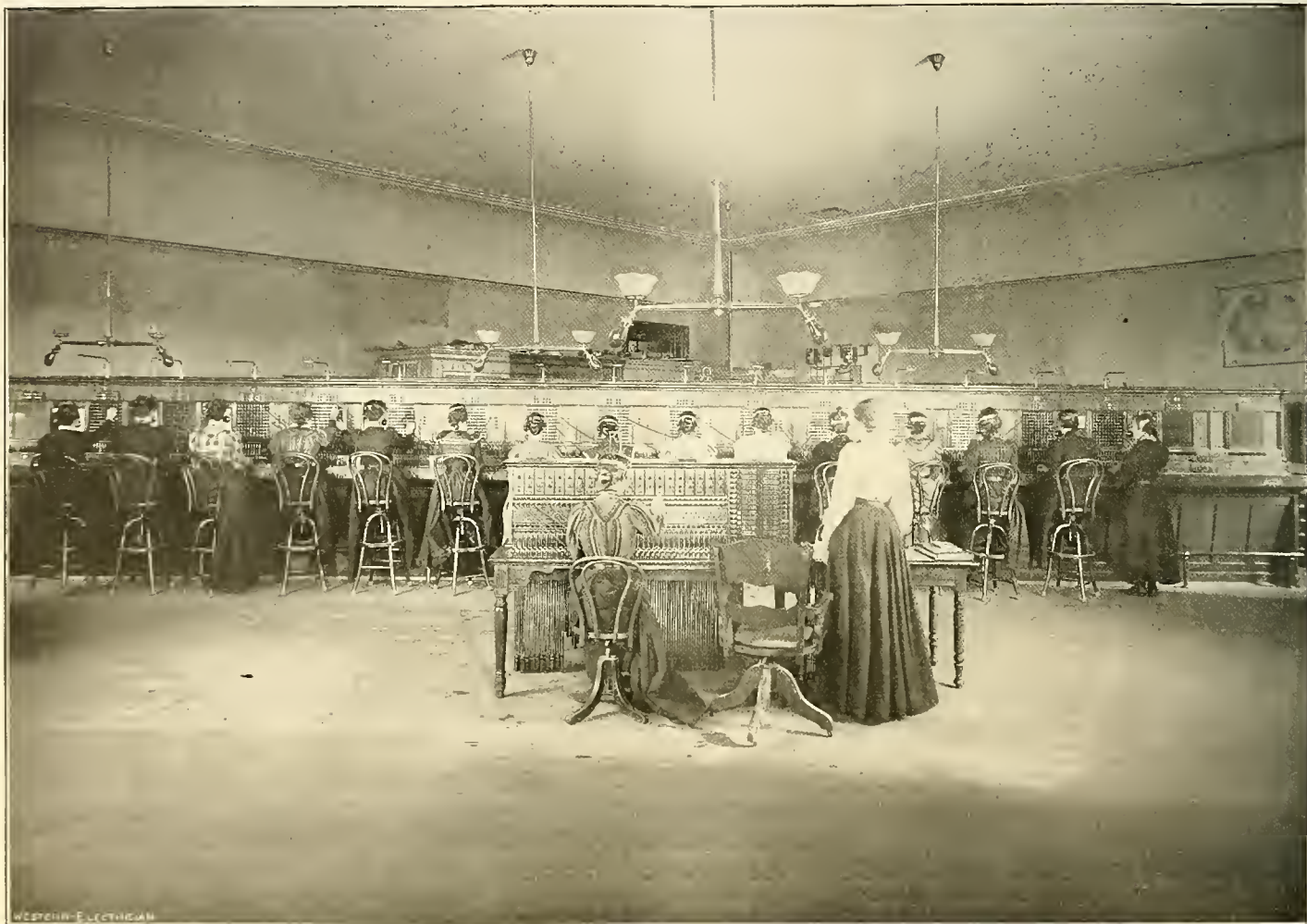


FIG. 1. CENTRAL-OFFICE SYSTEM OF THE NEWARK TELEPHONE COMPANY.—OPERATING ROOM IN NEWARK EXCHANGE.

miral heads, as shown by Fig. 5. Fig. 6 shows the power board, the storage batteries being placed in a closet at the left.

The subscribers' stations are equipped with Western apparatus, consisting of granular carbon transmitters, long-distance induction coils, double-pole receivers and the usual magneto-electric signaling arrangements.

As mentioned before, the underground cables terminate in head, as shown in Fig. 5. The cable circuit are then extended to their respective arrester terminals (Fig. 4) by means of specially formed office cables laid in ducts under the center of the distributing board. From the arrester terminals the circuits are extended to the test side of the distributing board by means of twisted pairs of rubber-covered jumper wires threaded through the distributing frame in their proper order. The test jacks (Fig. 3) are connected to the switchboard line terminal by cable, as shown in Fig. 2.

Before describing the operation of the complete system, it is essential to understand the purpose and location of the power board equipment, which was designed particularly for this plant. After laying out the exchange system it was found necessary to supply the following currents for the purposes mentioned:

1. Operator's transmitter circuit, two volt direct current.
2. Relay circuit, 100 volt direct current.

The machine is connected in such a manner that the 75-volt current may be reduced to 20 volts for use on the lamp-signal circuits. This feature is of special value in case of a serious accident to the larger machine.

The two-volt transmitter battery and 20-volt signal battery are charged by a double dynamo whose shaft is coupled directly with that of the 500-volt motor-generator. Referring to Fig. 6, in which the machine to the left is the 500-volt motor-generator with the double dynamo somewhat to the right. At the extreme right the 110-volt motor-generator is placed. Immediately behind the machines is the polished slate switchboard, upon which numerous switches have been mounted, together with the voltmeter, ammeter, resistance lamps, transformer and the double dynamo field-regulating rheostat.

Returning to the switchboard equipment, it should be explained that each operator is required to attend to 100 subscribers' lines. The lines terminate in a combination spring-jack and annunciator drop, which are so placed in relation to each other that after a shutter has assumed its tripped or "incoming-call announcing" position, the operator's answering plug cannot enter the spring-jack without restoring the shutter to its normally hidden position. The operator's section is further supplied with the usual equipment of interconnecting cords, listening and ringing cams, hand-driven calling-current gener-

tween the sub and main-office operators and permits the latter to make a direct request upon the former for connection with the desired subscriber. After completing the conversation either subscriber, by sending a ring-off current over the line, actuates a clearing signal on the sub, trunk and main switchboards.

The installation is furnishing satisfactory service, and the equipment is pronounced by experts one of the most complete in the country.

Southern Telephone Association.

[From the Memphis correspondent of the WESTERN ELECTRICIAN.]

Managers of independent telephone exchange systems in Tennessee held a meeting at Memphis recently, at which an association was formed and a movement inaugurated for the purpose of making arrangements to hold conventions at some convenient place and at regular intervals of all persons in the South interested in the independent telephone business. At the meeting the Southern Telephone association was adopted as the name under which the organization would operate. James D. Randall of Memphis was elected president, C. W. Bolton of Pontotoc, Miss., secretary, and George W. Scheuing of Memphis, treasurer. The first formal convention will be held on July 5th, and telephone manufacturers will be invited to display their apparatus and participate in the meeting.

Independent Telephone Movement in Indiana.

By S. P. SHEERIN.

The development of the independent telephone business in Indiana within the last three years, and notably within the last 12 months, has been a most remarkable accomplishment.

The telephone business of the state, under exclusively Bell management, had been rather dwarfed and unsatisfactory. In 1883 the Legislature passed a law fixing the maximum price for telephones at



FIG. 2. CENTRAL OFFICE SYSTEM OF THE NEWARK TELEPHONE COMPANY.—BACK OF MAIN SWITCHBOARD.

\$3 per month. At that time the Central Union Telephone company, which is a Bell licensee, pulled out a dozen or more of the smaller exchanges in the state. When the company removed these exchanges, it took with it every vestige of good-will which it had previously enjoyed in the several localities. The management of the business in the remaining cities, while in the main in the hands of capable men, was so hampered by exacting conditions and red tape that the service was never popular, and was confined almost exclusively to people who could not well get along without telephones.

When the basic patents expired a few years ago, the active independent telephone manufacturers found a most inviting field in Indiana. Exchanges sprang up all over the state and grew to full vigor, like mining towns, in a few months. It is a singular thing that not one of the projectors of Indiana independent telephone exchanges realized how rapid the growth of the business was going to be. The result has been that a great many exchanges have had to be rebuilt entirely, and fitted up to a capacity, in many instances, five times greater than that first arranged for to meet the expectations of the promoters.

The Indiana independent telephone owners are not people who run away from a prospective fight. There is now not a large city in the state that has not either an independent telephone plant in active



FIG. 3. CENTRAL OFFICE SYSTEM OF THE NEWARK TELEPHONE COMPANY.—DISTRIBUTING BOARD, TEST SIDE.

operation in competition with the Central Union, or one in process of construction. The number of Central Union plants of the state, as given officially in a \$6,000,000 mortgage recently filed by that company, is 41, while the independent exchanges of the state number 147.

The building of independent plants was the forerunner of the construction of several thousand miles of independent telephone lines. Some of these are copper metallic of the very best construction and fully equal to the Bell and Central Union lines.

Others are iron metallic, fairly good lines—indeed, very good for purely local purposes—and the balance are grounded lines, which answer the purpose for short-distance work fairly well. It is proper to say that of these latter, however, 70 per cent. will be rebuilt with either copper or iron and made complete metallic circuits within the next year. They are not things of beauty to look upon, and perhaps not always the most satisfactory in operation, but they have been great educators of the people in the use and necessity of the telephone, and from that point alone have been worth all they cost and more, too. Then, too, the users of them have the satisfaction, which the owner of the log cabin felt, in the reflection that while he might be temporarily inconvenienced, the thing was all his own, and he could enjoy it without any man's interference. There are now over 4,000 miles of independent toll lines in the state.

Telephone movements, like revolutions, never go backward. No man or woman who has ever had a telephone is ever again entirely happy without one. This is the case in country districts as well as in crowded cities. There are in Indiana to-day, in farm-houses alone—by this I mean the houses of actual farmers, engaged in the cultivation of their own land—over 5,000 telephones, and the number is growing daily. In many places in this state co-operative lines, extending for 10 or 20 miles, have been built by farmers for the sole benefit of connection with one another and the village railway station. The thrifty farmer, at a nominal cost, can now walk into his comfortable sitting room, ring up his county town, and have his ear to the markets of the world at every hour of the day. If his machinery breaks down in the seeding or harvest field, he can order a duplicate of the broken part to be sent him on the next train without leaving his home. In case of sickness, he is in immediate touch with the doctor, and if the angel of death shall descend upon his home, he is in close and sympathetic communication with his minister. The boys and girls of the country find the telephone a great addition to the joys



FIG. 4. CENTRAL OFFICE SYSTEM OF THE NEWARK TELEPHONE COMPANY.—DISTRIBUTING BOARD, ARRESTER SIDE.

of life. The young woman who, having been dressed and waiting for three-quarters of an hour, begins to fear that she will be late for the opening of the dance, can learn at once whether her expected attendant, who lives four miles away, has yet driven from his home in her direction.

The telephone, to the Indiana farmer, is the sort of stock which he has satisfied himself, in his short experience, he can afford to improve at all necessary cost. Therefore, the replacement of rickety and indifferently constructed grounded lines by good substantially built metallic lines is only a matter of very short time, and is just as sure to come as the magnificent gravel roads of the state have succeeded the mud and corduroy roads of a few years ago; just as sure to come as the magnificent school-houses, which dot the state from one end to the other at intervals of a mile or two, followed the hewed log school-houses of the early settler, which were many miles apart.

The most notable development of the telephone in Indiana within the last year has been made in and about Indianapolis. The New Telephone company of Indianapolis, a purely local institution, broke ground for its exchange the latter part of last June, since which time it has put in 53 miles of conduit space in the central part of the city and has covered the remainder with the very best pole construction that it is possible to obtain at this time. In fact, the Indianapolis plant has attracted the attention of the entire country. The company bought property in the center of the city and erected its own building at a large cost, and has an exchange room which is said by experts to be a model.

The company started out to procure 2,000 five-year contracts as evidence that the people desired to support a competing telephone company. The 2,000 contracts were quickly obtained, and in a little while the number swelled to 3,000, and now upon the eve of opening the exchange the company is obliged to contract for an additional 500 section of switch-board. The plant provides for complete metallic circuits of copper throughout. The switchboard is a full multiple manufactured by the Kellogg Switchboard company of Chicago, and the cables are the work of the Standard Underground Cable company of Pittsburg. The switchboard is now upon the ground and is being wired up. The cable

is practically all installed, and the plant will be ready for operation by the first of April.

It may be well to remark here that the citizens of Indiana have solved for themselves the problem of the inconvenience of two telephones to their entire satisfaction. It has been the red-ribbon argument of the Bell people that two telephones are a nuisance; that when there are two exchanges, every subscriber has to have both telephones, thereby largely increasing the worry and expense; that the telephone is a natural monopoly, and therefore the company in possession ought not to be disturbed, etc.

There is not a city in Indiana having an inde-

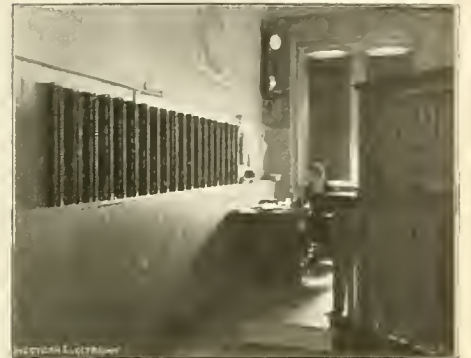


FIG. 5. CENTRAL OFFICE SYSTEM OF THE NEWARK TELEPHONE COMPANY.—UNDERGROUND CABLE TERMINALS.

pendent plant that would retrace its steps and go back for good to the condition it was in before the independent plant was started. Competition has increased the value of the telephone to the individual user in every instance. It has induced better service, more courteous treatment and greater familiarity with the great advantages of the telephone. It has forever settled and put at rest any danger, come what may, of the telephone being the luxury of the favored few. The policy of the Bell people in the lifetime of their patents was to select the most favorable territory and sell their service at a price that only the people most highly favored by fortune could afford to pay. The independent people have proceeded upon the theory directly opposite. They have sought to cover the whole field, at prices within the reach of all the people, relying for their profits on the enlarged use of the telephone. How well they have succeeded every one of your readers can determine for himself by a comparison of the situation in his neighborhood to-day with that which existed four years ago. They have succeeded so well that the Bell people themselves are now making laudable efforts to follow their righteous example.

In addition to the work done by the New Telephone company, the work of the New Long-distance Telephone company, a corporation with a million dollars of capital, composed exclusively of Indiana people, with headquarters at Indianapolis, organized for the purpose of supplying the entire state with

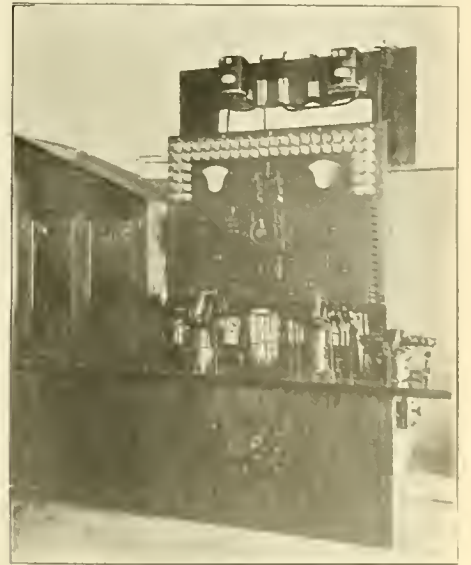


FIG. 6. CENTRAL OFFICE SYSTEM OF THE NEWARK TELEPHONE COMPANY.—POWER BOARD EQUIPMENT.

long-distance service, connecting up the county seats of the state with Indianapolis and with each other, has been doing an immense amount of construction, and will be able to put the New Telephone company in connection with 70 state exchanges and innumerable toll-station points, immediately upon the completion of the plant in Indianapolis.

The New Long-distance company confines itself solely to the building of toll lines, and proceeds upon the theory that local exchanges succeed better when entirely under control of local people. The New Long-distance company makes long-time contracts with county-seat exchanges for toll-line busi-

ness, leaving to the county-seat exchanges the exclusive control of the toll business within the county, and takes to itself all the business going out of the county. The arrangement is highly satisfactory to both parties and makes a very strong combination. In addition to this contract with local exchanges, the Long-distance company has also contracted with all the independent metallic toll lines of the state

Central-energy System at Henderson, Ky.

The telephone exchange recently installed by the Henderson Telephone and Telegraph company at Henderson, Ky., is particularly interesting, because of the standing of the men interested, the character of the service required and the type of equipment employed.

The company was formed by H. K. Cole of Owensboro and J. W. Walker of Morganfield, Ky., who secured as the principal stockholders the most prominent business men in Henderson and Morganfield. The present officers of the company are: President, A. Waller; vice-president, O. W. Rash; secretary and treasurer, O. P. Dyer.

The constructing of the exchange and the selecting of the system was entrusted to Messrs. Cole and Walker, who have had considerable experience in the telephone business; they have large interests in other exchanges and are thoroughly familiar with the best class of construction and equipment.

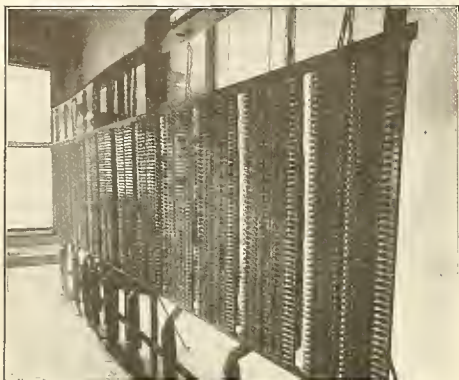


FIG. 2. CENTRAL ENERGY SYSTEM AT HENDERSON, KY.—LIGHTNING-ARRESTER AND CROSS-CONNECTING BOARD.

for interchange of business along their respective lines, and has also contracted for business along several hundred miles of independent lines, not now metallic, upon condition that the same be made metallic within a given time.

The independent telephone companies of Indiana have a state organization known as the Indiana Mutual Telephone association, of which Mr. E. H. Andress of Lafayette is president and Mr. H. B. Gates, secretary of the New Telephone company of Indianapolis, is secretary. This organization has done magnificent work for the furtherance of the independent telephone movement, and may be relied upon at all times to give needed aid and advice to newcomers into the independent telephone field.

In a paper necessarily as brief as this it would be impossible to give full credit to the independent telephone movement of Indiana and the individual efforts of the bright men in the several cities of the state who are devoting their energies to the business. It may be said in a general way that the movement is in good hands and that our independent friends, the country over, may always expect without fear of disappointment to hear good reports from Indiana.

Weather Service.

[From the Washington correspondent of the WESTERN ELECTRICIAN.]

The sundry civil bill has been amended by Congress so as to include a provision for the purpose of

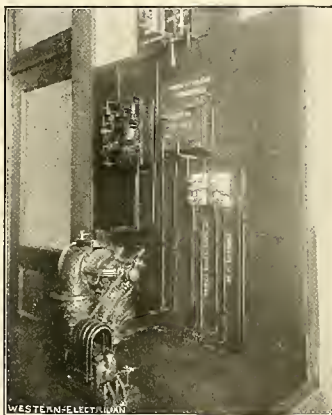


FIG. 3. CENTRAL ENERGY SYSTEM AT HENDERSON, KY.—RINGING AND BATTERY CHARGING EQUIPMENT.

The exchange was built as a permanent investment, and knowing that the enterprise would meet sharp competition from the old company, no expense was spared in putting in a high-class plant. In the line construction copper wire is employed and complete metallic circuits are used throughout, with paper-covered cable on the principal leads. The central-energy system manufactured by the Stromberg-Carlson Telephone Manufacturing company of Chicago was adopted.

Fig. 1 shows four sections of 100 connections each of the central-office switchboard, the original equipment installed to serve 400 subscribers, with which number the exchange started. The board, in appearance, is similar to that company's individual gen-

erately underneath the lightning-arrester board, from which they are run through the combination fuse and carbon lightning arrester to the switchboard.

Fig. 3 shows the ringing and battery-charging equipment. The motor-generator is run by the trolley line circuit and supplies the energy for the sub-



FIG. 4. CENTRAL ENERGY SYSTEM AT HENDERSON, KY.—BATTERY EQUIPMENT AT EXCHANGE.

scribers' ringing the central office and also the current used for charging the storage batteries. Power for operating the generator employed in calling subscribers from the central office is secured from the same source. At the top of the board is a 500-volt double-pole knife switch for throwing on the trolley current, also a switch for throwing on the electric-light circuit. The center of the board is occupied by the C. H. starting-box and the power-generator transformer, and also switchboard power-generator circuit switch and battery-charging switch.

Fig. 4 shows the subscribers and operators' telephone-talking battery in duplicate, also the subscribers' ringing battery for emergency use.

Fig. 5 shows the type of telephone used in central-energy exchanges.

With all batteries of the entire system placed at the central office, they are under the direct super-

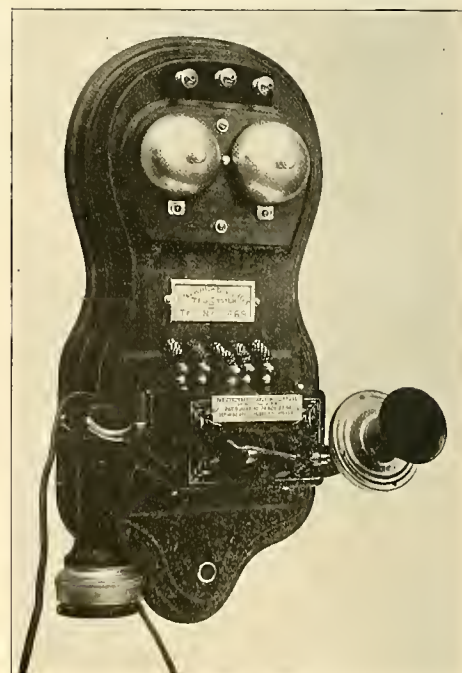


FIG. 5. CENTRAL ENERGY SYSTEM AT HENDERSON, KY.—SUBSCRIBER'S EQUIPMENT.

vision of the manager of the exchange, and can be maintained at a very small expense. With the batteries and generators taken away from the subscriber's station, it leaves practically nothing requiring attention, and the subscribers are saved the annoyance of inspectors' visits, which are necessary in local-battery systems.

In this system the subscriber signals the central office by pressing the push-button at the lower end of the instrument, while the "disconnect" signal is automatically given by placing the receiver on the hook when through. In this way it is impossible to fail giving the "disconnect" signal.

Toll lines are now being constructed by the company for connecting with the interstate toll-line systems, and when completed direct connection can be made from any of the subscribers in this system, over any of the toll lines.

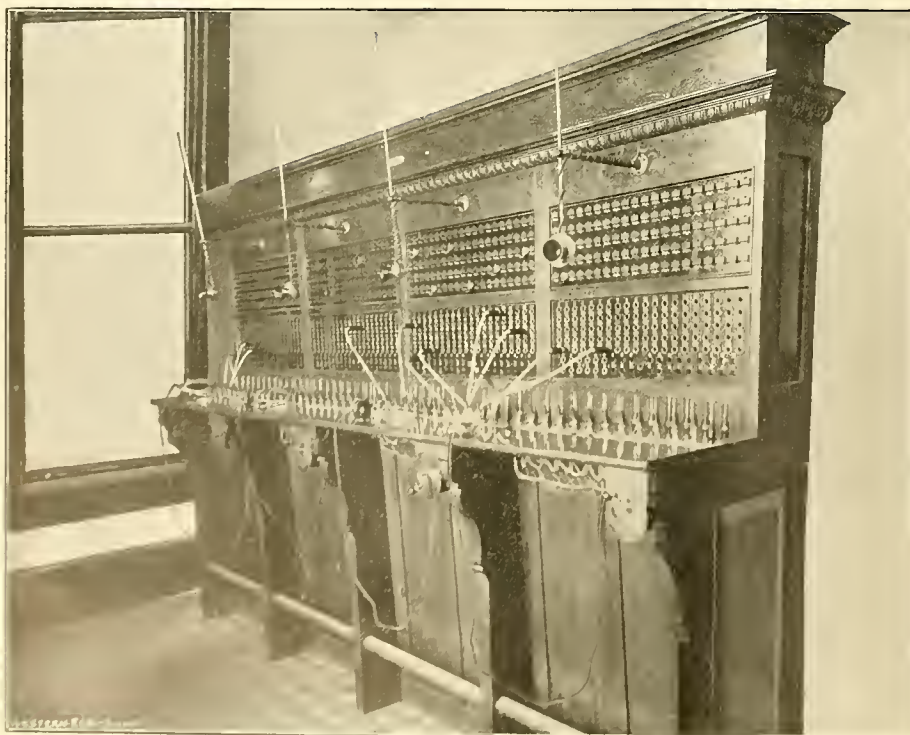


FIG. 1. CENTRAL ENERGY SYSTEM AT HENDERSON, KY.—400-LINE BOARD.

erator call-system boards, but is wired for the central energy system, and is provided with a hand generator for emergency use. The board has a trunking capacity for 1,000 subscribers.

Fig. 2 shows the lightning-arrester board and cross-connecting board. The leads enter the office in 10 100 pair cables and terminate in pot-heads immedi-

ately underneath the lightning-arrester board, from which they are run through the combination fuse and carbon lightning arrester to the switchboard.

Largest Independent Exchange in Iowa.

The largest independent telephone exchange in the state of Iowa, and one of the largest in the United States, is that of the Mutual Telephone company, which was established in January, 1897, upon the mutual or co-operative plan, with 800 stockholders. As an inducement to the public, the promoters of this company named a basis of rates so that the stockholders paid an annual rental of \$24 for their business telephones and \$18 for their residence telephones, while subscribers who were not stockholders paid an annual rental of \$36 for their business telephones and \$24 for the residence.

The company commenced operation in October, 1897, with 500 subscribers. After operating the ex-



FIG. 2. LARGEST INDEPENDENT EXCHANGE IN IOWA.—CHIEF OPERATOR'S DESK AT DES MOINES.

change upward of a year, it was discovered that the original plans upon which the installation had been made were not adapted to the situation, and the company was unable to increase as fast and as extensively as the demand required.

In the fall of 1898 the management thoroughly investigated the field of telephone equipment, and as a result of its investigation placed a contract with the Sterling Electric company of Chicago for a 1,200 drop metallic-circuit switchboard and complete exchange equipment, consisting of distributing board, cable terminals, toll boards and monitor's desk. On January 1st the installation was completed and the company was serving 1,200 stations, of which 800 were residence and 400 business telephones.

At the time of the organization of this exchange the Bell company was serving 735 patrons, but the old concern has been losing ground steadily, and now a large percentage of the telephones are fur-

The Mutual Telephone company is recognized as being one of the most prosperous and profitable enterprises in the city of Des Moines. The company has invested over \$100,000 in plant, and furnishes employment to 30 construction men and to 24 exchange operators. Since its organization, the company has built over 600 miles of toll line, and its

board of 1,200 drops, while Fig. 2 shows the chief operator's desk and monitor, and Fig. 3 is a view of the distributing board of 1,200 wires' capacity. Fig. 4 gives a view of the line equipment with the Sterling pole-top terminal in use. The entire equipment was built and installed by the Sterling Electric company of Chicago. The Mutual Telephone company of De

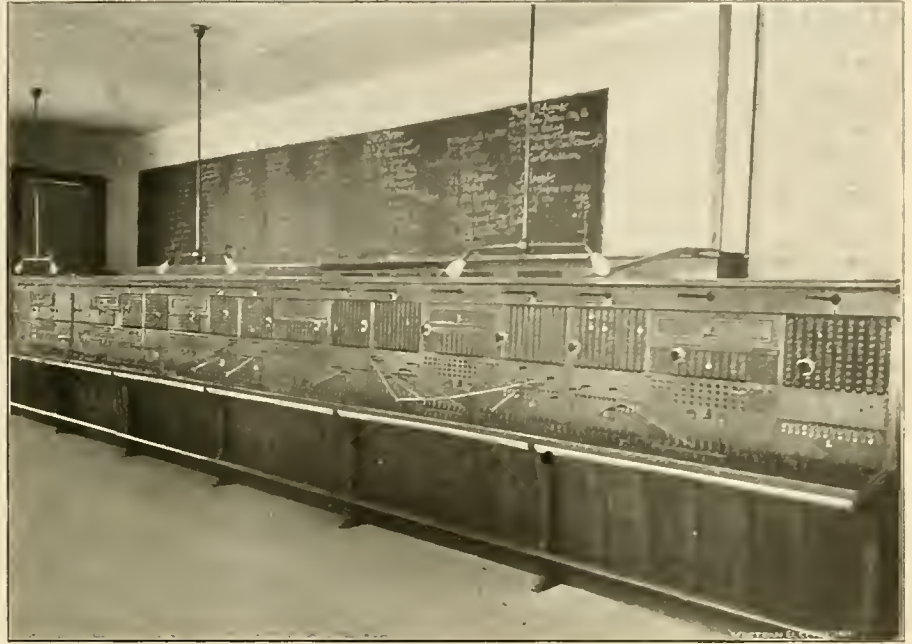


FIG. 1. LARGEST INDEPENDENT EXCHANGE IN IOWA.—1,200 LINE SWITCHBOARD NOW IN USE.

system is connected with over 300 of the leading towns in the state of Iowa. The growth of this company is so rapid and constant that before the close of this year it expects to be serving 3,000 patrons. It now has with the Sterling Electric company of Chicago an order for additional equipment, which will greatly increase the facilities and improve the service. The officers of the company are J. W. Hill, president; D. F. Witter, vice-pres-

Moines is living evidence of the possibilities of an independent telephone company when properly equipped and properly managed.

Independent System for Minneapolis.

A Minneapolis paper published an alleged prospectus of the J. C. Hubinger company, which proposes to establish telephone exchanges in Minneapolis

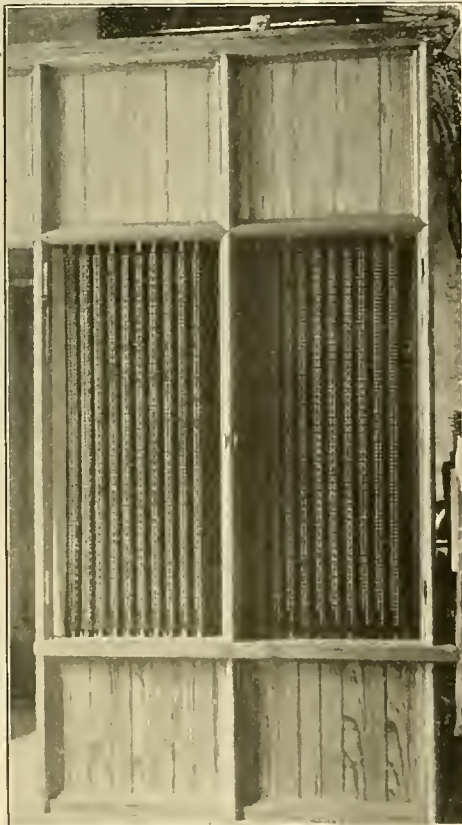


FIG. 3. LARGEST INDEPENDENT EXCHANGE IN IOWA.—DISTRIBUTING BOARD FOR 1,200 CONNECTIONS.

nished free of charge. Prior to the incorporation of the Mutual company the Bell company's rates ranged from \$36 to \$72 for residence and \$60 to \$72 for business houses. The rates now range from \$12 to \$36. The city administration in Des Moines, during the last year, has revoked the franchise of the Bell company and ordered it to remove its poles and wires from the street, as they were a nuisance and a menace to life and property. This order is now being bitterly contested in the courts of that city.

dent; H. E. Teachout, secretary, and A. C. Miller, treasurer. The company has secured as general manager Mr. Paul M. Krahnner, who has been closely identified with the telephone field for years. Mr. Krahnner resigned his position with the Chicago Telephone company to accept his present engagement at Des Moines. He has had wide experience and is acknowledged to be one of the most competent experts in the country.

The present equipment is illustrated herewith. In Fig. 1 is shown the Sterling Electric company's



FIG. 4. LARGEST INDEPENDENT EXCHANGE IN IOWA.—LINE EQUIPMENT WITH POLE-TOP TERMINALS.

and St. Paul. This company has secured a four-story building at 414-416 Third avenue south, Minneapolis, for its exchange. It adjoins the exchange of the Northwestern company. Switchboards of the Stromberg-Carlson pattern have already been ordered and are expected to be in place by April 1st. The building will be wired at once and the cables brought into the basement. Over \$100,000 will be spent in putting the offices and exchange in shape. The company expects to have 500 instruments in operation by April 15th and 1,200 by July.



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DEPARTMENTS.

Table listing departmental contents such as Electric Light, Electric Railway, Power Transmission, etc.

the campaign by denouncing the political managers who foisted him on the public two years ago and then lacked the courage to repeat the dose. Possibly they realized that the public would not stand any more nonsense of that kind.

Permission to land a cable in Cuba has been sought by the Commercial Cable company, but as the Western Union claims exclusive privileges under grants from the United States and Spain, the subject has been referred to the law department, and the attorney-general will give an opinion. The fact that the government has decided not to grant any long-time franchises in Cuba under existing conditions is taken as an indication of its policy in all matters affecting the island.

The bill repealing the much-discussed "Allen law" has passed both houses of the Illinois Legislature by a practically unanimous vote, and has been signed by the governor.

The law related to street-railway companies, and authorized municipalities to extend the franchises of existing companies for 50 years, and also gave the companies of every city in the state the right to charge a fare of five cents for a period of 20 years. It aroused a storm of popular disapproval, the Chicago daily newspapers being particularly active in opposition to it; and in repealing it the state senators and representatives executed the will of the people.

Legislation affecting street-railway companies of other states is occupying considerable attention at this time. In Wisconsin particularly is this noticeable. Organized labor throughout that state is urging the passage at Madison of the bills of the Citizens' League to regulate the business of street-railway corporations. The Federated Trades' Council of Milwaukee has indorsed the measures and the State Federation of Labor will send a representative to Madison in behalf of both organizations to use vigorous efforts to secure the passage of the bills. The proposed bill provides that street railways shall keep open accounts with the state, so that their actual earnings may be apparent to everyone, and also empowering city councils to fix the rates of fare. A resolution favoring the measure was signed by 50 union-labor organizations.

In such a serious professional paper as the Lancet of London is published Dr. Julius Althaus' recommendation of electrical treatment to make old men, if not exactly young again, at least much younger in appearance, disposition and action. Dr. Althaus describes old age as a disease and believes in applying a current of electricity to the brain to improve the nutrition of the nerve cells. This sounds a good deal like the claims of the electric-hairbrush, electric-belt and electric-sole men, who have been denounced and derided for years by physicians and electrical engineers. But Dr. Althaus, whoever he may be, seems to promulgate his startling theory with the gravity of a sage. It is said that in some cases this treatment has made old men five or 10 years younger in a few weeks. Any physician can apply the treatment, but the doctor's readers are warned that it must be used with care. Says Dr. Althaus:

"It is notorious that electricity is frequently applied in the most careless and haphazard manner, and this explains why so many persons are skeptical concerning its curative effects. An application of the constant current to the brain during which not the slightest fault has been committed is in a certain sense an artistic performance, which requires not only knowledge, but also much practice and some talent, like a good musical performance. How often does one hear a sonata by Beethoven or a polonaise by Chopin actually murdered? The same applies to electrical treatment. A man who labors with love and care, and has the discrimination to select one of the methods described by me or several of them which may be particularly appropriate for a given case, will, in the nature of things, obtain better results than another whose heart is not in his work, who acts by mere routine, and who is devoid of the elements of an artistic disposition or true clinical instinct."

Still there are some who will remain unconvinced by the reasoning of this artist in electrical manipu-

lation. The proposition is much like Sir William Crookes' plan to enrich the wheat-fields of the earth with nitrogen taken from the atmosphere by electrical means—one is apt to cogitate upon it for some time before accepting it as a verity.

By failing to make provision for beginning the work of constructing the Pacific cable Congress has again seriously delayed that important public improvement. The failure of the bill providing for the necessary appropriation is attributed to Speaker Reed, whose hostility to the administration's policy on expansion has been shown in many ways. It is admitted that the administration keenly feels the defeat of this measure, and it is evident from published expressions of opinion that the business interests of the country do not relish the idea of the speaker venting his spite in such a manner. There was a general demand for the establishment of telegraphic communication between this country and its newly acquired possessions in the Pacific, and President McKinley sent a special message to Congress in which he pointed out the importance of providing for a cable, but Speaker Reed, who has antagonized everything which had any bearing on the policy of expansion decreed that a cable should not be constructed at this time, and he succeeded in stifling all legislation of this character.

As a result of this failure by Congress to make suitable provision for a cable it will be inconvenient to communicate with the Pacific possessions of this government, and as all correspondence will have to be carried on by mail it will take more than a month to send a communication from Washington to Hawaii and get a reply. Happily, existing conditions do not give any concern, but President McKinley would like to have had cable connection with the islands so as to shorten the time to Manila. He will have to wait until the convening of the Fifty-sixth Congress before that question will be again considered, and, in the meantime, the danger of a foreign government building a cable continues.

This number of the WESTERN ELECTRICIAN is devoted almost entirely to the independent telephone field. Marked advancement is everywhere apparent in this branch of the industry and its expansion during the last year has been on a scale far surpassing the most sanguine expectations of the gentlemen who have been engaged in its development. It is particularly noteworthy that the telephone business has attracted a much more influential class of investors in the last 12 months than those who engaged in the earlier struggles, and this has enabled the promoters of more ambitious schemes to invade the larger cities and enter actively into competition with the Bell interests in the strongholds of the old concern. The experience at Detroit has been repeated in many other places, notably St. Louis, and during the coming year Cleveland and Indianapolis will likewise be scenes of commercial warfare. By far the most important acquisition, however, has been the addition of Chicago to the list of cities which have granted franchises to anti-Bell companies.

In the present number it has been the aim of the WESTERN ELECTRICIAN to convey some idea of the magnitude of the independent movement, the advancement that has been made in the organization of exchange systems, the improvements and refinements that have been introduced in the apparatus and service of the independent companies and to introduce to all who are interested in this subject the gentlemen who have been most prominently engaged in bringing about the present advanced condition of the independent industry. The WESTERN ELECTRICIAN takes pleasure in presenting portraits of the leading independent telephone men of the country in the supplement which accompanies this number. The groups contain representatives of all branches of the telephone industry—inventors and manufacturers, dealers and salesmen, engineers and managers. They have all gained some prominence in their respective branches, and many of them are already known to readers of this journal.

The WESTERN ELECTRICIAN congratulates all engaged in this field upon the prosperity which they have enjoyed during the last year. For its part, it pledges the same earnest support to the independent telephone industry that it has freely accorded since the field was opened to competition.

It looks very much as if Sam Jones was going to lose his job. The "powers of darkness," as he describes the predominating influences in the Republican party, prevailed against him, and he failed to secure a re-nomination for mayor of Toledo. But Mayor Jones is not to be gotten rid of so easily. He will run on an independent ticket and enliven

Proposed Combination of Independent Manufacturing Companies.

The plans of the promoters of a combination or consolidation of independent telephone manufacturing companies have been published in the daily papers and discussed by the trade. The project was started in Chicago, but has not received the unqualified approval of the strongest western companies, and, at present, serious disagreements among those originally interested threaten the success of the movement. Representatives of the proposed "trust" are endeavoring to secure the co-operation of eastern manufacturers, but, according to reliable information from New York, Boston and Baltimore, the promoters have met with less encouragement than they anticipated.

One of the shrewdest men in the business, whose company will probably not join the trust, admitted that he regarded the formation of the trust as possibly the first step in the direction of transferring the independent factories to the Bell company. The stock of the consolidated companies will be listed and therefore easy of acquirement by the Bell interest. This feature of the situation is likely to appeal in the most emphatic manner to the independent exchange owner, and if he should take a decided stand with the object in view of not patronizing a concern that was soon to become the property of the Bell company, competing manufacturing concerns would undoubtedly soon appear in the field to supply his wants.

On the other hand, those manufacturers who favor the trust claim that some plan is necessary for improving the conditions now existing, as excessive competition is resulting in much needless expense.

We present the two sides of the case for the information of our many telephone readers.

Pioneer in Independent Long-distance Service.

In November, 1895, the Western Telephone and Telegraph company was organized, with George W. Beers of Fort Wayne, Ind., as president; C. H. Cory of Lima, Ohio, vice-president; D. J. Cable, secretary; W. H. Duffield, treasurer; and the intention of the incorporators being to connect a few of the independent telephone exchanges in and about Lima, Ohio, in which the incorporators themselves were interested.

The demand for such service, as reflected in the use of the lines, was so much greater than had been anticipated, that immediately the plan was enlarged so as to reach the Indiana exchanges in which Mr. Beers had become interested, as well as other exchanges in the immediate vicinity.

The authorized capital of the Western Telephone and Telegraph company having been fully absorbed, a reorganization was effected on August 18, 1897, under the name of the National Telephone and Telegraph company, with an authorized capital of \$1,000,000, with the same officers as those of the company which it succeeded.

The new organization, with that energy and push that characterize Mr. Beers' undertakings, has thoroughly covered the northwestern portion of Ohio and the northeastern portion of Indiana, giving the users of independent telephones a better service in that district than is furnished to the subscribers of the Central Union Telephone company by the Bell long-distance telephone system, because the National Telephone and Telegraph company's lines reach all the people in the small communities as well as in the towns and cities. The telephone is no longer a luxury in Indiana, enjoyed by the few, but has come to be a necessity employed by the masses in their every-day business and social relations; indeed, it has been said that one can telephone to points in that state where the United States mail does not go.

Together with the New Long-distance Telephone company of Indianapolis, whose lines are now being rapidly constructed in all directions from that city, the National Telephone and Telegraph company will reach all of the 127 independent telephone exchanges in Indiana. Arrangements have been made to connect at Toledo with the Ohio lines of the United States Telephone company, and connections have already been made at Sturgis, just beyond the Michigan line, with the great independent system of that state.

Thus are the citizens of three great states, using more than 50,000 telephones, put into every-day and easy communication with each other. The appreciation of those citizens now having access to these existing facilities has been manifested by a patronage which has compelled a duplication of most of the circuits in the system, and the managers believe that the increased use of the lines that will come with the inauguration of the greater system will call for additional circuits, for the erection of which plans are now being made.

Valley Telephone Company of Michigan.

From a point of connections per operator, or calls per subscriber, the Valley Telephone company, doing business in East Saginaw, West Saginaw, Bay City, West Bay City and Flint, Mich., claims to be in the lead. The construction and equipment of these plants were undertaken by the Sterling Electric company of Chicago. The work is of the highest

grade and enables the company to give a service superior to that of the Bell company. In view of this fact the public gives the Valley company the preference. Added to this is the advantage of a large and constantly increasing number of subscribers and the fact that a free-trunking service is furnished between the several exchanges. To meet the demands upon it the Valley company has placed an order with the Sterling Electric company of Chicago for special equipment that, when installed, will furnish such additional facilities as will enable it to meet the demands for some time to come. The Valley company believes in anticipating the wants of the public, and being a home institution, has the interests of its patrons at heart.

Telephone News from the Northwest.

[From the Minneapolis correspondence of the WESTERN ELECTRICIAN.]

The Northwestern Telephone Exchange company is securing a right-of-way for a toll line from Winnipeg Junction, Minn., to Red Lake Falls, Thief River Falls and St. Hilare.

The citizens of Mount Hope, Wash., are so anxious for telephone connection that they are setting poles and distributing them.

The council of Des Moines, Ia., finds it a hard problem to assess telephone and telegraph lines under the new law, requiring an entirely new system.

John Gallagher, the lineman who fell from a telephone pole in St. Paul, died of concussion of the brain.

The Inland Telephone company of Spokane, Wash., will erect a \$75,000 fireproof building there at once.

The Rushford Telephone company of Rushford, Minn., has placed a new switchboard in its office.

A local stock company in Ponda, Ia., has been granted a franchise for a telephone exchange, and it is expected to have the system in operation in 60 days.

The local telephone company at Hancock, Ia., is to be reorganized and made a joint stock affair.

The town of Pomeroy, Ia., will vote March 27th on granting a franchise to the Central Telephone company.

The telephone company at Sigourney, Ia., will extend a toll line to What Cheer, Ia., in the spring.

The town of Ida Grove, Ia., will vote March 27th on granting a franchise to the Iowa Telephone company.

The Home Telephone company of Fort Dodge, Ia., has placed another switchboard in place with 100 drops.

A new telephone company is projected at Nevada, Iowa.

Omer Smith of North English, Ia., has bought the Green Valley-Wellman telephone line from E. Hess.

Arrangements have been completed for the Perry Telephone company to connect its toll lines with Adair, Ia.

The Chamber of Commerce of St. Paul has passed resolutions favoring granting a franchise to the American Telephone and Telegraph company and favoring a law declaring telephone companies common carriers. It also voted to request the council to investigate the status of the Mississippi Valley Telephone company and ascertain whether it has not forfeited its franchise.

A bill has been introduced in the Minnesota House directing the state auditor to ascertain the total value of all properties belonging to telephone and other companies, and to levy an excise or license tax equal to the average rate of taxation.

Monroe, Ia., will vote March 27th on granting a telephone franchise to the Iowa Telephone company and also to the Central company.

A local telephone exchange is projected at Union, Iowa.

Ackley, Ia., has voted to grant the Iowa Telephone company a franchise.

George Merrill is figuring on a local telephone exchange for Verndale, Minn.

The Howard (S. D.) Telephone company has been incorporated, with \$2,000 capital stock.

The druggists of Minneapolis are considering an agreement to put in nickel-in-the-slot instruments. The company offers a rebate of 20 per cent. to them, and some figure that they would reduce their own bills materially by such an arrangement.

The City Council of St. Paul has demanded a more explicit statement from the Mississippi Valley Telephone company of its expenditures, in compliance with the terms of the charter of the company, which require that at least \$50,000 shall be expended in the city within six months.

George Vosbeck of Mankato, Minn., secured a verdict of \$3,500 for damages received by his son, Walter Vosbeck, from the property of the telephone company. The judgment is against the contractor who was constructing the system of the Mankato Telephone company.

The Pipestone (Minn.) Telephone company has secured new quarters for its central office, and will move into them soon.

The Luce-Vietch Telephone company at Galesville, Wis., has been sold to Perry Vietch. Mr. Luce retires.

The Ripon Telephone company of Ripon, Wis., will connect with the toll lines of the Little Wolf River Telephone company.

John Cochrane has bought all the stock of the

People's Telephone company in Waupun, Wis., and will hereafter be sole manager and proprietor.

A move is on foot to establish a telephone exchange at Aitkin, Minn.,

A local telephone company has been incorporated at Vinton, Ia., to be known as the Vinton Telephone company.

A long-distance telephone connection from M. d. forl, Wis., to Westboro, Wis., is projected.

The Wisconsin District Telephone and Telegraph company, which was granted a franchise in Superior, Wis., more than a year ago, will not abandon the project, but will build a long-distance line to Minneapolis. The mayor threatens to have the franchise abrogated, because it grants no rights or privileges to the city as compensation for the use of the streets.

The Chequamagon Telephone company of Ashland, Wis., announces that it will connect with Superior and Duluth as soon as independent telephone exchanges are established there.

The Story County Mutual Telephone company of Nevada, Ia., will undertake to establish an exchange in Nevada and toll lines over the county, to connect with the Boone and Marshalltown mutual companies.

The Northwestern Telephone Exchange company, in Minneapolis, gave a dinner at the Commercial Club, to the members of the canvassing department, as a reward for the excellent work the department has done. The local exchange now holds the record for the highest number of subscribers secured in any one month. For January the record of 425 was thought to be very good, but February exceeded it with 550. The company has tried the experiment during the winter of running a restaurant in its building to furnish food for its employees, and finds it very successful.

William Adams has bought a half interest in the Logan, Ia., telephone exchange.

Herman Moorck has secured sufficient subscribers at Aitkin, Minn., to assure the success of his proposed telephone exchange.

The Western Electric Telephone company has made a reduction in toll rates over its lines.

An electric-light wire fell across several telephone wires in Charles City, Ia., and burned out the telephones connected to them.

The Mutual Telephone company of Des Moines is working hard to get its instruments into the state-house. The Iowa Telephone company has 11 instruments there to the Mutual's one, and the latter thinks that as it forced the low rates and has as large a list of subscribers as the former, it is entitled to better patronage from the state.

Charter Oak and Prairie City, Ia., will vote on March 27th upon the proposition to grant the Iowa Telephone company franchises, and the Chariton and Newburn Telephone company's application for a franchise at Milo, Ia., will be determined the same day.

The Ottumwa Long-distance Telephone company of Ottumwa, Ia., has been granted a franchise by the council. The company has its system in, but takes this move as a precautionary measure. The city will vote on the franchise at the spring election.

At Winona, Minn., the Northwestern Telephone Exchange company is charged with placing poles without permission and doing considerable work without consulting the city engineer, as required by the ordinance. The city officials will look into the matter.

The new telephone exchange at North Branch, Minn., is about completed.

The Wisconsin Telephone company has made toll connection with Tomah, Wis.

Complaint is made at Detroit, Minn., that the Northwestern Telephone Exchange company is setting its poles in the country in reckless disregard to the rights of the public. It is charged that the poles are set in many instances in the public highway so as to require teams to turn out to avoid them.

The Lenora and Amherst Farmers' Mutual Telephone company has been organized near Lanesboro, Minn., to connect Soland, Amherst and Lenora with Lanesboro. Later the line may be extended to Canton, Newberg and Mabel.

F. H. Juergens and others have formed a partnership at Jordan, Minn., to build a telephone line to Lydia. The line is to be in operation by May 1st.

The telephone exchange at Rush City, Minn., is about completed. It will start with 26 connections.

Business men of Faulkton, S. D., have made arrangements to secure long-distance connection.

The Overland Telephone company's petition for a franchise at Melrose, Ia., will be voted on by the people of that town March 27th.

A number of improvements will be added to the telephone system at Wabasha, Minn., in the spring. Heavier and taller poles will be put in and other changes made.

The Hillsboro, Duane, Caledonia and Shelly Telephone company of Hillsboro, N. D., has made arrangements with the Northwestern Telephone Exchange company for a traffic exchange.

The Sauk Center (Minn.) Telephone company has been formed and will proceed to purchase and install an exchange at once.

The bill which has been pending before the Minnesota Legislature, providing for placing the telephone companies under the Railroad Commission, has been killed in committee.

The Dwelle Telephone company proposes a number of improvements to its system at Lake City, Minn., in the spring. Toll connections will be made with the Northwestern Telephone Exchange company.

Combined Police-signal and Telephone System.

The police-signal and telephone system recently installed in the central station of the Chicago Police Department by the Municipal Police Signal company of Chicago is said to be the only one in which the circuit apparatus is not used for signaling. The signaling equipment is used on regular metallic or common-return telephone wiring in connection with the telephone system. This saves the running of a separate circuit for the signaling in large cities, where it is impossible to operate a telephone system on a circuit line. The direct-line system also prevents confusion in indicating at central office, as no other number than the one from which the signal is given can be turned in.

If any line becomes broken it disables only the station to which it extends, and not a whole district, as in a circuit system.

Fig. 1 shows a board for 30 main lines for police

office lines call, the drop falls and closes the (local) circuit, starting the night-bell or buzzer, which continues until the shutter is restored. In this way, at the regular time for reporting by the patrolman, if there is a citizen's or patrolman's call for a wagon it makes separate and distinct indications on the switchboard; the wagon call can be answered at once, and need not be delayed until all the officers in the district have reported, as is necessary where circuit systems are employed.

In the lower part of this section is located a spring-



JACK CORRESPONDING WITH EACH LINE. On the table, in front of the indicating board, are shown a number of ringing and listening plugs provided with proper connecting conductor cord.

When a wagon call is given a ringing plug is inserted in the jack corresponding in number with the bell indicating, and the power-generator key, shown at the right of the plugs on the table, is pressed, or the hand generator is operated, which rings the bell in the patrol box and denotes that the call has been received. When a reporting signal is given, an answering plug is inserted in the proper jack and the call answered by telephone.

The plugs can also be used for connecting patrol boxes in the same district, or with any other district, through the trunk lines, or with any of the officers or other lines that may be connected with the police-telephone system.

In cities where independent exchanges are established the patrol-box telephone or other police-system line can be connected direct with any of the subscribers in the local exchange, or for long-distance work, if necessary.

This is especially desirable late at night, when public telephone offices are closed, and the patrolman detects anything unusual about a place of business and desires to call the owner regarding the matter.

At the left of the drops and jacks a galvanometer and strap keys used for testing lines, etc., are shown; also a switch for throwing off or on the night circuit.

The board is provided with two portable telephones

At the lower end of the box is the regular reporting generator, used by the patrolman when reporting or when telephone connection is desired. When operated, it throws the drop, but does not ring the bells at the board.

In the center of the box is placed a telephone receiver, transmitter, etc. The telephone apparatus is so arranged that the battery is supplied from the central office. This is a long-distance instrument, and can be used on any length of line.

The patrol station is also provided with a "recall" bell, which is placed at the top of the patrol booth, and is a special extension bell with compound magnets and large gongs. It is used for calling patrolmen to the box. With this system once well understood by the public, any person hearing the bell would

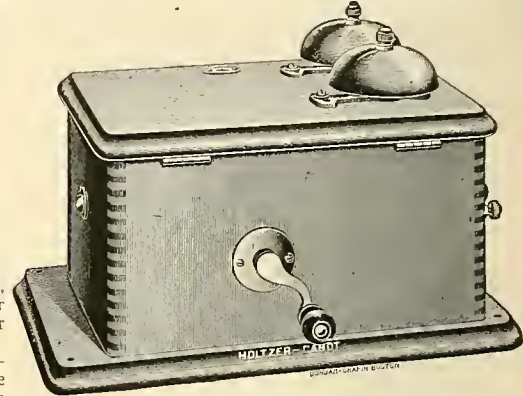


Fig. 1. Bell Complete.

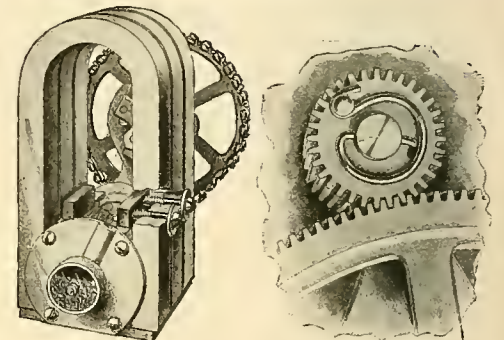


Fig. 2. Armature.

HOLTZER-CABOT MAGNETO BELLS.

Fig. 3. Gearing.

at once inform the nearest patrolman, should the latter be too far away from the box to hear the call during the busy part of the day in streets where there is considerable traffic.

Where desired, the citizen's or wagon-call instrument can be used as a fire alarm, and the equipment used as a combined police, fire-alarm and telephone system. No batteries are required in the signaling system, and the central-energy telephone system is used, providing for the transmitter battery at the central office, leaving no batteries at the local stations to freeze or get out of order. This system requires no delicate apparatus in its operation. It is being introduced for use with park-police systems and large private institutions, as well as in municipal service.

Central Telephone and Electric Company's New Home.

Among the companies that have enjoyed uninterrupted prosperity since their formation the Central Telephone and Electric company of St. Louis occupies a conspicuous place. A view of a portion of the office and salesrooms in the new quarters is presented in the accompanying illustration. The company's new offices, salesrooms and factory at 909 Market street contain 8,500 feet of floor space. The company has been doing business some time, but with the increase in the equipment it was found desirable to make some changes. Accordingly it was incorporated January 16th with James S. Cuming as president and general manager, and it is now prepared to manufacture everything in the telephone line.

Holtzer-Cabot Magneto Bells.

In several important details the magneto bells manufactured by the Holtzer-Cabot Electric company of Boston differ from other types on the market. The magnets are held on by means of short bolts, which enter into projections in the field pieces. They can therefore be firmly secured without any danger of springing the fields. This construction admits of the generator being taken from the box without removing the hook, or even taking the magneto from the wall.

The generators are equipped with gears or chain and sprocket. The latter method of driving is very popular. The connections between the driving wheel and pinion are made adjustable, and a special hard-steel chain is used, which is guaranteed not to stretch or wear. The gears are finely cut, have an extra wide face, and are practically noiseless in operation.



FIG. 2. COMBINED POLICE-SIGNAL AND TELEPHONE SYSTEM.—PATROL BOX EQUIPMENT.

boxes, and one each for the chief of detectives, desk sergeant, captain and inspector, with necessary capacity for trunking lines to other stations and other offices. In the top section of the board are arranged the wagon-call indicators, consisting of a polarized bell, each with a small shutter made of thin sheet aluminum, held up by a catch over the bell-hammer pin.

Under the shutter, on the face of the board, is

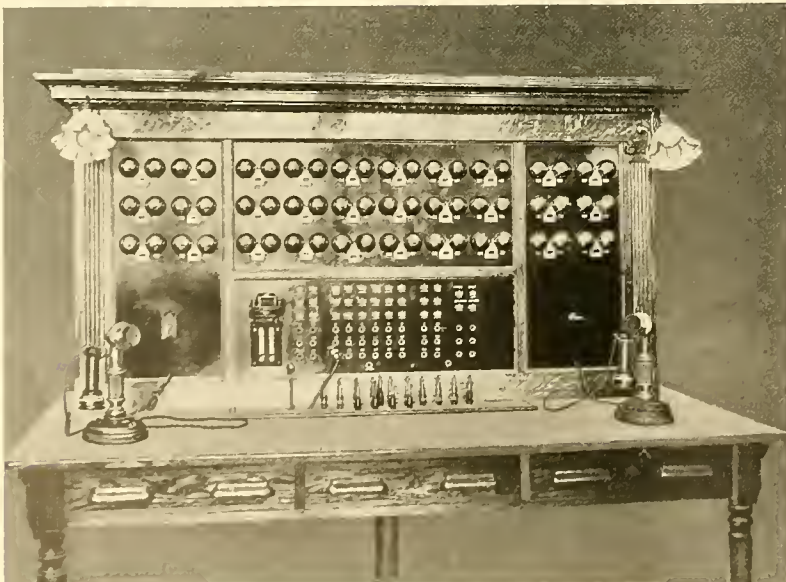


FIG. 1. COMBINED POLICE-SIGNAL AND TELEPHONE SYSTEM.—30-LINE BOARD FOR POLICE SERVICE.

The number corresponding to the patrol box connected to this line. When a wagon call is given by a citizen or patrolman, the bell will ring and the bell-hammer pin release the light aluminum shutter, which will fall and show the number of the box from which a call is made. A wagon can be dispatched at once without any farther notification.

In the top of the lower center section are the patrolman's regular supporting signals. These consist of drops with shutters, the same as used on telephone switchboards, and provided with a night circuit. On the inside of the shutter is marked the location of the station with which it is connected. If a regular reporting signal is given from any of the patrol boxes, or if any of the other district trunking or

for attendant's use. These instruments are provided with a plug and connected with the board at a spring-jack at the bottom of the jack-plate.

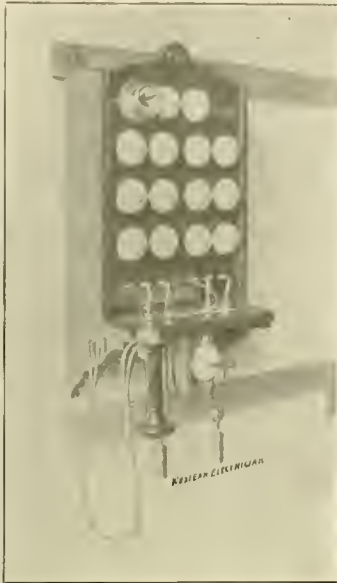
The patrol box is shown in Fig. 2. At the upper end, on the outside of the box, will be seen a crank, which is connected with a generator in the inside. This is for a citizen's call, or when a patrolman has made an arrest and calls for a wagon. When the generator is operated it rings the polarized bell in the office.

At the upper end of the box, inside of the door, is a polarized bell, mounted on a heavily japanned iron box, which is the "answer-back" bell, operated from the central office to denote that the wagon call is being answered.

The flexible method by which the pinion is attached to the shaft assures a steady and uniform movement of the armature while passing through the varying magnetic field. The appearance of the completed bell is shown in Fig. 1, while Fig. 2 represents the generator and Fig. 3 the method of gearing.

Kusel Long-line Switchboard.

The cut shows the new, compact and neatly designed long-line switchboard recently put on the



KUSEL LONG-LINE SWITCHBOARD.

market by the D. A. Kusel Telephone and Electric Manufacturing company of St. Louis. This switchboard possesses many valuable improvements and is thoroughly reliable. It is simple, positive and quick, and, like all instruments manufactured by this company, is practical and perfect in mechanism. This is only one of the many improvements in telephony

shows a lever switchboard for connecting the several divisions of toll lines. It is also used in several stations that have from three to 10 private telephones, as there is nothing to get out of order. It is arranged so that the extension bells are between the board and ground, and when the telephones are in use the extension bells are cut out.

Ericsson Breastplate Transmitter with Head-gear Receiver.

The arrangement illustrated herewith will be found convenient for busy central-station work, where it is desirable for the operator to have both hands free. The key for the primary circuit is placed beneath the transmitter, and by moving the small arm to either side two positions and different modes of connections are obtained. In one the key has to be depressed to make the primary circuit, and in the



ERICSSON BREASTPLATE TRANSMITTER WITH HEAD-GEAR RECEIVER.

other the key is kept down, thus securing a constant connection and saving the battery. When the operator is not too busy, she releases the key and only keeps it down while speaking.

The plate, transmitter and receiver are all made of aluminum, which somewhat reduces the weight.

The transmitter can be turned and the mouth-piece adjusted to any suitable distance. The mouth-piece is removable. Where the operators are very busy the primary key is replaced by a spring arranged so that the current is connected when the mouthpiece is in the ordinary speaking position, but disconnected when the transmitter is turned back.

furnished with automatic self-registering attachment, especially designed for this purpose.

Mianus "98" Telephone.

The accompanying illustration shows a telephone subscriber's instrument that is now being exploited most energetically by the Mianus Electric company of Mianus, Conn.

This is a strictly high-class telephone. The outfit is provided with the "98" transmitter two-cell battery box. Its size at the bottom is 13 inches by 31 inches, complete with 10,000-ohm bell receiver and

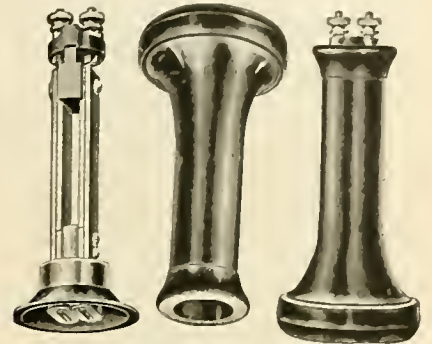


FIG. 1. AMERICAN COMPANY'S SPECIALTIES.—NEW TYPE OF RECEIVER.

cord, as shown in cut, with an oak or walnut finish. The Mianus Electric company's factory is running full blast, as business is excellent.

American Company's Specialties.

The American Electric Telephone company has several attractive novelties which it is introducing to the attention of independent telephone managers.

Chief among these is the handsome receiver which is illustrated in Fig. 1. The cut shows the instrument complete and the component parts when it is dismantled. It is a graceful device and is handsomely finished and highly polished, presenting a very attractive appearance. By removing the cap which is screwed on the top, the shell may be removed for examination, adjustment or repair, all the working parts being secured so as to form practically one piece.

Another attractive novelty is the "kitchen telephone." This is the Burns one-way telephone and is particularly handy for domestic service, permitting a housekeeper to call up the gro-

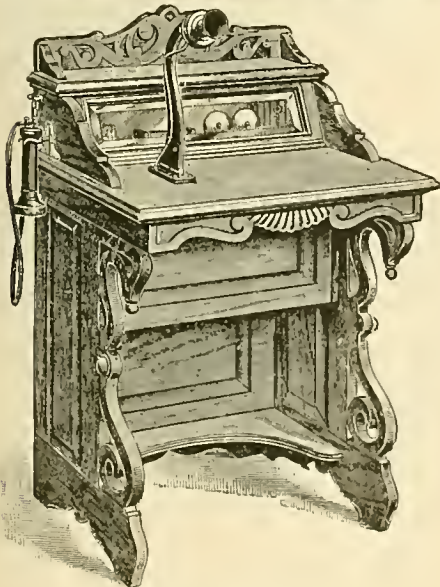


LEVER SWITCHBOARD FOR TOLL LINES.

made in the last year by the company, which manufactures only high-grade instruments.

Lever Switchboard for Toll Lines.

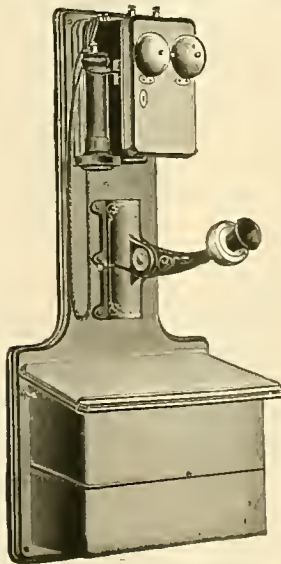
The Western Illinois Telephone company of Augusta, Ill., has exchanges at Macomb, Rushville and Carthage and operates 700 miles of toll lines, con-



KEYSTONE CABINET SET.

necting the principal towns in Adams, Hancock, Brown, Schuyler, McDonough and Fulton counties. The company's lines cross the Illinois River at Beardstown and the Mississippi River at Warsaw, submarine cables being used. It has toll stations in 59 towns and furnishes connection through other lines with 21 additional points.

The peculiar character of the service has created a demand for a special switchboard, which has been met by the equipment herewith illustrated. The cut



MIANUS "98" TELEPHONE.

The frame is thus completely insulated and does not, as in the other, serve as conductor.

The Ericsson Telephone company of 20 Warren street, New York, reports that this class of equipment has proved highly satisfactory. The growth of the business is gratifying, and the demand for these high-class goods is encouraging, because it shows that the people appreciate goods of genuine merit, and are not backward in adopting such goods when they find by actual experience their real worth.

Keystone Cabinet Set.

A special equipment for office and pay-station service is offered by the Keystone Electric Telephone company of Pittsburg in the form of an attractive cabinet set, illustrated in the accompanying cut. This set is furnished with a complete equipment of the Keystone company's high-grade apparatus, and the desk is attractively finished and durably constructed. When desired for pay stations this set is

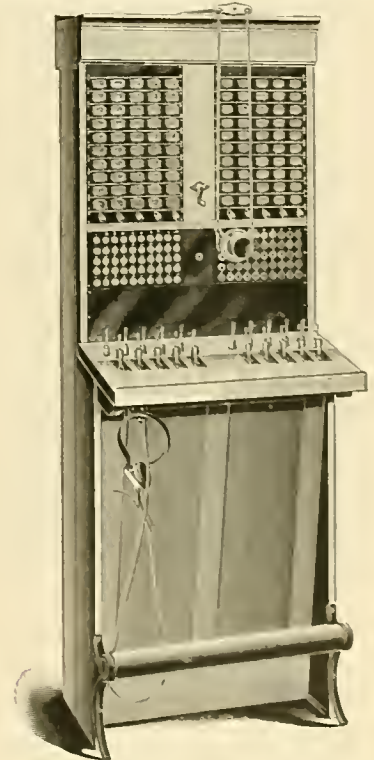


FIG. 2.—AMERICAN COMPANY'S SPECIALTIES —IMPROVED BELL-TYPE SWITCH BOARD.

cer, butcher or other trader, but not affording facilities for receiving calls from other subscribers. These instruments are compactly made and contain a compartment back of the transmitting mechanism for holding a couple of cells of dry battery. One-way telephones have been very generally adopted in San Francisco, where they received the name of "kitchen telephones." They are also being introduced into Grand Rapids on an extensive scale by the local independent company operating in that city, which has placed an order for 1,000 instruments with the American company.

Probably the most important addition to the Amer-

ican company's line of equipment is the new metallic switchboard, which is illustrated in Fig. 2. This board contains all the desirable features of the Bell type, it is declared, and many additional advantages are included. The drop is of the well-known tubular type, and a soft-iron tube incloses the coil, connections for which are made by means of two insulated pins passing through the removable back strap, enabling a defective or injured coil to be removed without disturbing the adjustment of drop or shutter. The armature lever is short, reducing the weight or friction on the shutter to a minimum. The drops are arranged in rows of 10, with a restoring rod for each row, and mounted horizontally on metal strips. Only as many banks of drops need be installed as the service requires. Below the drops the jacks are located in rows corresponding to the shutters. The plugs and combined listening and ringing keys are mounted in the usual manner on a shelf, which is covered with heavy leather to prevent noise and reduce wear on plug handles. Below the subscriber's jacks a blank panel is provided for adding trunking facilities, should the increase in service demand it. Space for clearing-out drops is also provided, and the usual plug test for cord circuits is placed in the center of the board.

Eureka Equipment.

The Eureka Electric company of Chicago has already found its quarters too small and has just

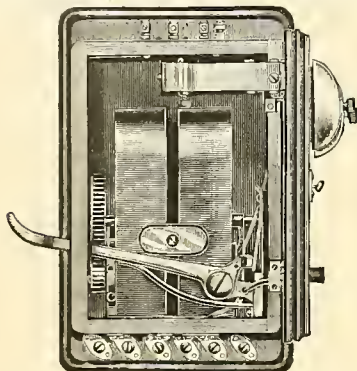


FIG. 1. EUREKA EQUIPMENT.

taken the adjoining building, which will give to this company the largest floor space on the ground floor of any telephone company in the world. This company, while one of the youngest in the field, is already securing its share of the telephone business. It is making a specialty of a new high-grade magneto bell (Fig. 1), for which claims of superior construction are made. The switch is self-contained and the magneto-generator is of heavy tungsten steel, with ringers of the well-known bell pattern. It is full-nickel and furnished with platinum contacts when desired. The company's transmitters are of the solid-back type and are powerful and efficient. The receivers are double-pole, and the construction work throughout is of a high grade. The switchboard of this company, known as the Eureka metallic express (Fig. 2), is giving satisfaction wherever used and is in great demand. The company is placing upon the market a new intercommunicating system, known as the Eureka auto-inter system, which does not require any plugging or lever switches. By simply pushing the button on the station desired connection is secured, and it is impossible to leave one station cut in upon another, as the act of placing the receiver upon the hook cuts out the station automatically.

The management of the company is in the hands of Messrs. Kusel and Stein. The company is represented upon the road by Messrs. Kusel, Platt, Miller and Wood. It is comfortably located at 157 and 159 South Canal street, Chicago, where it has sales-rooms and offices, in which switchboards, cross-connecting boards, cable heads and telephones are displayed. The company also furnishes catalogues on application, and pay-station signs are distributed among exchange managers.

NEW COMPANIES.

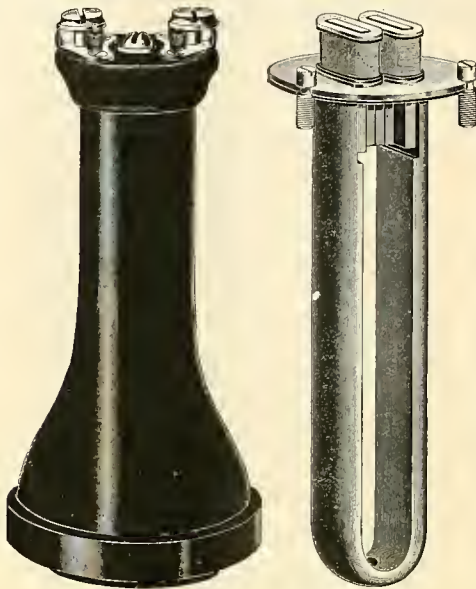
The Constableville and West Leyden Telephone company of West Leyden, Lewis County, N. Y., has been incorporated to operate a telephone system connecting Rome, Martinsburg, Houseville, Constableville, Mohawk Hill, West Leyden, West Branch, Boonville and Highmarket. The capital is \$3,000, and the directors are Benedict Cantier, S. C. Capron and J. Capron of Leyden, Frederick Myers and Elizabeth Myers of West Leyden, and J. J. Dourner of Lewis.

The Kurtz National Telephone company has been incorporated for \$20,000 at Belleville, Ill. The company is named after its president, W. J. Kurtz, and will use his new instrument and tower system. The Hon. W. De Bolt of St. Louis is secretary and treasurer; Victor H. Adams, electrician for the L. M. Purney Manufacturing company, will be vice-president. These officers, together with L. M. Purney and Joseph M. Duffy, constitute the directory. Over 200 five-year contracts have been secured at Belleville for service, and a model exchange with St. Louis connection will be built.

Williams Electric Company's Transmitter and Receiver.

Figs. 1 and 2 illustrate respectively a sectional elevation and a plan view, with the diaphragm removed, of the new Williams solid-back microphone. The patents covering this microphone are owned and controlled by the Williams Electric company of Cleveland, which has the exclusive right to manufacture and sell these instruments in the United States and Canada.

It is claimed for these microphones by those who

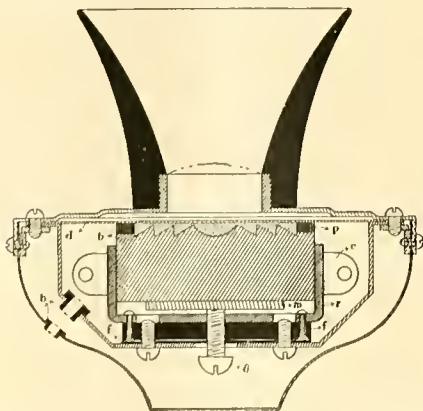


FIGS. 3 AND 4. WILLIAMS ELECTRIC COMPANY'S DOUBLE-POLE RECEIVER.

have used them that they are not only the most sensitive, but also the most powerful instruments that have ever been used in the independent telephone field. These instruments talk well with one cell of battery, but at the same time they will stand without sputtering as many as three bichromate batteries for heavy long-distance work.

Referring to Fig. 1, *b* is the carbon back-plate, which is ground around the periphery so as to make it perfectly cylindrical and of a uniform diameter. This carbon back-plate is then fitted into a brass receptacle *r*. This brass receptacle is itself mounted upon a disk *f* and *f'*, through which the adjusting screw *a* passes that butts against a brass disk *m*. Upon turning the adjusting screw *a*, the carbon back-plate is carried toward the diaphragm, and the face of it is at the same time maintained perfectly horizontal and in exact alignment with the face of the diaphragm. When the proper or desired amount of adjustment is reached the carbon back-plate *b* is locked in position by means of a double split clamp *c*. This forces the carbon into intimate contact with the brass receptacle *r*, and the brass disk *m*, which is between the carbon plate and the adjusting screw *a*, forces additional contact surface. This method of gripping and retaining the carbon plate gives an electrical contact of a very low possible resistance.

The diaphragm *d*, which is of either carbon or



FIGS. 1 AND 2. WILLIAMS ELECTRIC COMPANY'S TRANSMITTER.

gold-plated ferotype, is clamped and held rigidly and perfectly in its position between the cap-plate of the microphone and the metal receptacle by four machine screws, thus affording a very perfect electrical contact between the diaphragm and the other metal parts of the transmitter.

The granule-retaining ring *p* is made especially for the company from silk fibers, and while it is sufficiently rigid to maintain the carbon granules in their proper position, it is still extremely flexible and resilient, so as not to impede the amplitude of the vibrations of the diaphragm. This in a large measure accounts for the volume of sound as well as the sensitiveness of this instrument. The carbon

granules are made by a new and secret process, which makes them extremely hard and yet at the same time very light. It will be noticed by referring to the drawings that the diaphragm is situated very closely to the back-plate, so that there is scarcely any room for carbon granules between the points of the serrations in the carbon back-plate and the diaphragm. This leaves the support of the carbon granules almost entirely to the back-plate itself, the diaphragm not having the weight of the granules directly against it. With this arrangement it is impossible for the granules to wedge or pack between the diaphragm and the back-plate and thus deaden the transmitter.

Figs. 3 and 4 are exterior and interior views of the new Williams double-pole receiver, the latter showing the horseshoe magnet, which is composed of the very highest grade of magnet steel, and

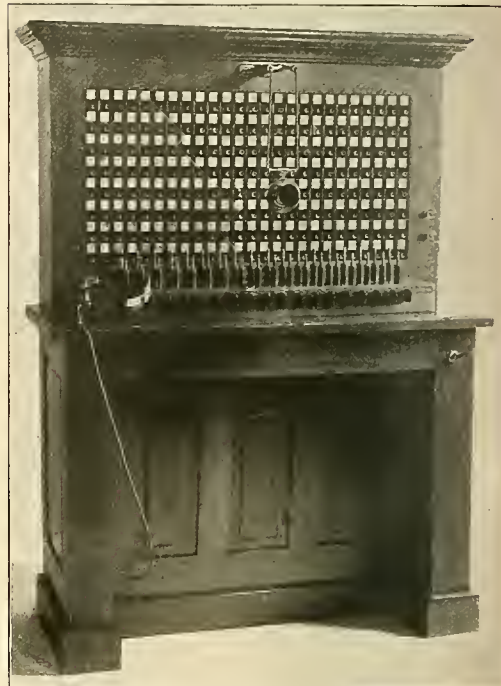
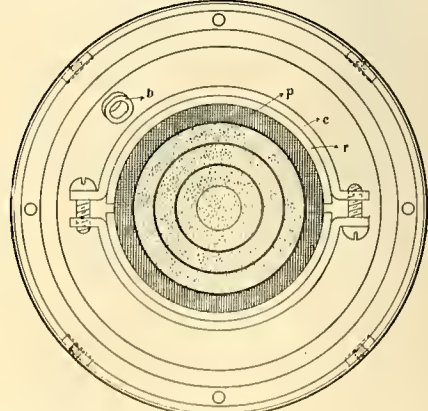


FIG. 2. EUREKA EQUIPMENT.

is of a semi-circular cross-section, so as to fit snugly into the receiver shell and use all of the available space in the shell. The bobbins for this receiver are supported in a brass disk, which in turn is supported by three screws which thread into the hard-rubber receiver shell near the diaphragm end. The horseshoe magnet is supported at its neutral axis or the binding-post end of the receiver, and it straddles or grips the bobbin cores, imparting to them its magnetism. The permanent horseshoe magnet is so powerful that it will lift six pounds of iron while its own weight is but 4 1/2 ounces. The weight of this receiver complete is 12 1/2 ounces.

The binding posts of this receiver, as will be seen from Fig. 3 are novel in construction, in fact being the only spring-lock binding post that has ever been used on a telephone receiver. This form of binding post is said to be rapidly replacing the old style lock-



nut binding post, as a loose contact is simply out of the question, there being a continuous spring tension exerted against the receiver-cord tip at all times.

The Williams Electric company of Cleveland, Ohio, was incorporated April 12, 1898, and began the manufacture of magneto bells three months later. The demand for magneto bells of this company's make became so great that it had to enlarge its quarters and place additional machinery. On the first of this year the company began the manufacture of double-pole receivers and long-distance telephone transmitters. It is now manufacturing everything that enters into the complete equipment of the subscriber's end of a telephone exchange.

New Automatic Lightning Arrester.

The illustrations represent a practical and ingenious lightning arrester, or rather an abnormal current arrester, guaranteed to take care of all abnormal currents of high or low tension on telephone circuits. The principal features of this device are stated to be these: It is purely automatic in its operations, requiring no attention whatever after being installed; there are no fuses to burn out to interrupt the service, and there is practically no resistance in the magnets on the talking circuit.

The operation of the device is as follows: The

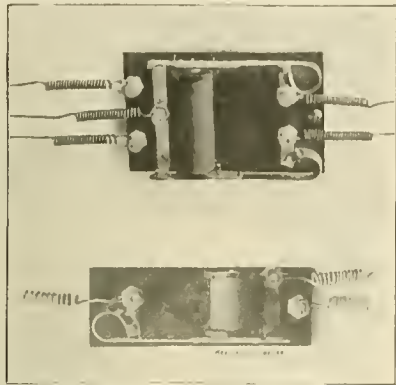


FIG. 2. NEW AUTOMATIC LIGHTNING ARRESTER.

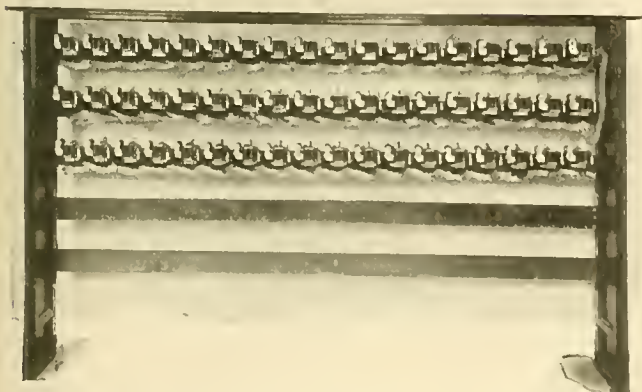
protector stands in its normal position only so long as the ordinary working currents are on the line. In this position all currents pass through the electromagnets, which are made very sensitive without interposing much resistance on the line (from 1 to 5 ohms only). If for any reason the line receives an overcharge, such as lightning or through accidental contact with trolley wires or electric conductors, the arms are instantly drawn in, shunting the current around the magnets, making direct connection to ground. The abnormal currents will take the path of least resistance, passing to the ground, leaving the telephone, switchboard or other instrument connected with the magnets unharmed. As soon as the line is relieved of the overcharge the moving parts automatically resume their normal position without the necessity of adjustment or repairs.

During the entire year's trial at the exchanges and on the toll lines of the Kent and Ravenna system, there were no cases of lightning or trolley crosses too severe for the arrester to take care of perfectly.

This automatic lightning arrester (shown in Fig. 1) is made for either grounded or metallic circuits, for use at the telephone instrument or put up in sections for switchboards (Fig. 2), requiring floor space much less than required by the ordinary fuse board. The metal parts are nicked, and, together with the magnets, mounted upon polished rubber, black fiber or porcelain base. As now constructed the contacts to ground are carbon, readily taking care of sneak currents as well as those of greater volume. This arrester is manufactured by the Butler-Taylor company at Ravenna, Ohio.

Lundquist Automatic Telephone System.

There has been inquiry for years for an effective automatic-telephone system, the advantages of which are obvious. Mr. F. A. Lundquist, the superintendent of the National Automatic Telephone company of Chicago, is the inventor of the apparatus herewith illustrated, and he claims that his company has the only practical automatic telephone system in existence. The patents are owned and controlled by the



FIGS. 1 AND 2. LUNDQUIST AUTOMATIC TELEPHONE SYSTEM.

company mentioned, which manufactures and sells the instruments direct to local companies or communities.

It is said that by this system a subscriber having an automatic telephone can almost instantly connect himself with any other subscriber without the assistance of anyone, and any number of conversations can be carried on without interfering with one an-

other. The switchboard (Fig. 1) is very simple in construction, and therefore durable. There is not a point or coil that will not, it is claimed, carry fully 20 times the amount of current of an ordinary drop board, making possible the use of one or 1 1/2 or even two-ampere fuses. The working parts of the automatic board are substantial, and will not get out of adjustment easily. It would seem that there necessarily would be more complication in an automatic switchboard than in a manual board, but the company asserts that this is not the case. Many of the exchanges using the automatic board have men in charge who are inexperienced in telephones and switchboards. Still all of these exchanges are said to be giving entire satisfaction to the users. It is also claimed that the automatic system gives perfect and economical toll-line service. A great advantage is that the service is the same in small exchanges as in large ones, and the service is the same at night as during the day. The only difference in expense between installing an automatic system and any other system is the first cost of instruments.

It is asserted that the owners of automatic exchanges can furnish patrons with cheaper service than those who use any other kind, and still the profit on the investment is greater by at least 20 per cent. Another point emphasized is that an exchange can be extended at any time without any extra cost



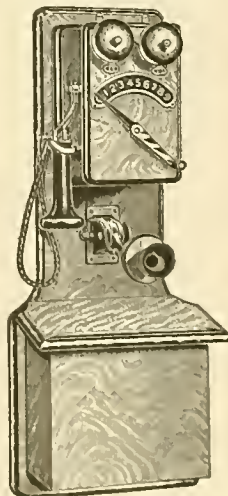
FIG. 1. NEW AUTOMATIC LIGHTNING ARRESTER.

other than the cost of the new telephones ordered. Fig. 2 shows the Lundquist telephone. Some 30 exchanges are now using the National automatic system, it is said. The first system was installed in Sterling, Kan., in April, 1897, and is said to be giving perfect service.

The National Automatic Telephone company also manufactures an interior-telephone system which is wholly automatic.

Telephone Legislation in Delaware.

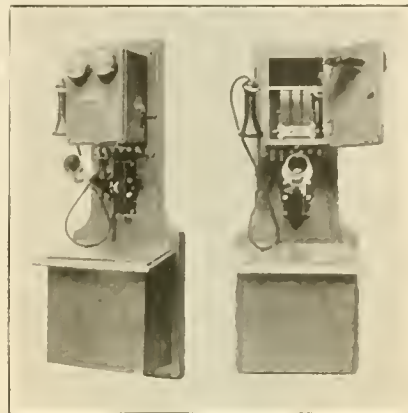
Representative Donahue has introduced a bill in the Delaware Legislature which provides that all per-



sons, companies or corporations engaged in furnishing telephone service shall be permitted to make three classes of subscribers, and thereby charge one rate for the use of telephones in hotels, another for places of business and a lower rate for private residences, but the charges for the services to the three classes named shall always conform to the provisions of the present regulations.

New Apparatus of the Western Telephone Construction Company.

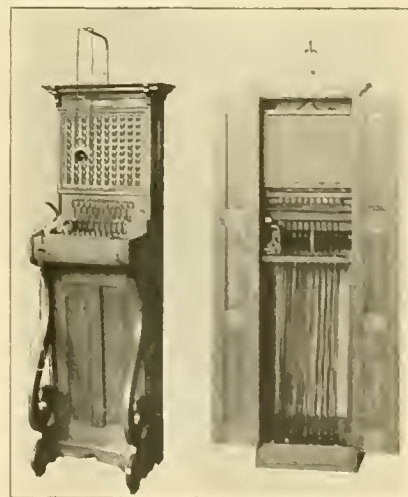
The Western Telephone Construction company, Chicago, is busily engaged in meeting the great demand for its newest type of "Keelyn A" telephones. The new telephone is a remarkably complete piece of mechanical and electrical apparatus. The magneto-generators are equipped with the best material obtainable. The pole-pieces and armature are made of a special grade of iron prepared exclusively for the use of the Western Telephone Construction com-



FIGS. 1 AND 2. NEW APPARATUS OF THE WESTERN TELEPHONE CONSTRUCTION COMPANY.

pany. In addition to using a superior grade of material, the several parts have been designed with a view toward meeting the most exacting demands of telephone engineers. The permanent magnets are made from the best magnet steel thoroughly aged after magnetization. This aging process was adopted by the company after many expensive experiments, and it destroys every chance of building up a compound permanent magnet with anything but the highest grade of material. Another point for careful consideration is the magnet cores used in building up the magneto-bell magnet system, which consist of the finest Norway iron drawn to the proper thickness. The generator armature, ringer magnets and induction coils are wound with the best grade of copper wire carefully insulated with silk.

Another improvement has been made in the automatic hook switch (Fig. 2), a long lever taking the place of the old-style, short-lever receiver-supporting prongs. The main springs, however, with their platinum contact points, have been retained, not being susceptible of further improvements. The telephone is equipped with the well-known Keelyn receiver, which, it may be mentioned, is the only one of its kind having no exposed metallic contacts, thus in-



FIGS. 3 AND 4. NEW APPARATUS OF THE WESTERN TELEPHONE CONSTRUCTION COMPANY.

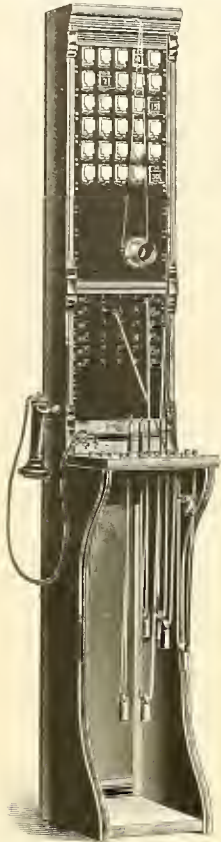
sure complete immunity from dangerous accidental electric shocks.

Another invention of merit is the new "Keelyn A" transmitter. This transmitter is not only a solid back but a solid front as well, which is a feature not found in other types, adding, no doubt, a great deal toward making the "Keelyn A" telephone one of the most elegant, efficient and desirable pieces of apparatus on the market.

Figs. 3 and 4 show respectively a front view and an open back view of the Western express switchboard. The Western Telephone Construction company desires to make the announcement that the Western express switchboard has been meeting with a success unparalleled by any switchboard ever produced, both in efficiency and unsolicited praise from the independent telephone engineers, and justly so, it appears, for wherever this apparatus is placed on a

competitive test the company asserts that it rarely fails to "win out."

The cabinet work is of the best grade quartered oak. It is filled, rubbed and varnished before any apparatus is allowed to be installed, thus insuring a perfect and lasting finish. The back part of the switchboard is arranged with a pair of paneled interlocking doors, which protect the working parts against the entrance of dust and also the tampering tendencies of inquisitive operators or visitors. The



HOLYOKE SWITCHBOARD.

keeping the manufacturing department constantly "on the jump," so to speak, in order to keep pace with the ever-increasing demand.

Holyoke Switchboard.

The switchboard made by Holyoke & Holyoke of Chicago is in use in the island of Jamaica, Alaska, Mexico, Canada and nearly every state in the Union.

The drop is constructed on mechanical lines whereby through leverage the power is greatly increased. The ringing and listening cams are of new design. The board is well made of the best material with hard-rubber front and German-silver springs. It is quickly operated and gives general satisfaction.

The factory is at Clinton and Van Buren streets, where, with new machinery and increased force, the firm is prepared to fill all orders promptly. They also make a specialty of magnets, induction coils and special coils, and are equipped with dies for making them in variety.

Jones' Special Telephone Set.

The accompanying cut illustrates a new telephone set now being pushed by J. Jones & Son, dealers in supplies, at 640 Cortlandt street, New York. The set is called the "new standard \$5.00 set," and its simplicity and other excellent qualities make it an instrument of great desirability, especially for private-line service. Dr. Emile Hotzen took two of these telephones and fittings to Germany, and he recently stated in the presence of a representative of the WESTERN ELECTRICIAN that they were now installed on a three-mile iron-wire line from a farm to a village in Germany, and were giving excellent service. Such foreign appreciation, in a country, too, noted for its fine mechanical and electrical skill, speaks well for the workmanship of the Jones telephone set.

William Roche.

William Roche, the inventor of the New Standard dry battery, is receiving flattering orders from the United States navy and Europe for his cells,



WILLIAM ROCHE.

and some of the brightest managers of independent telephone stations have long since become aware of their durability and quality. The Standard Telephone and Electric company of Madison, Wis., is handling most of the western business for this cell, carries a full line in stock and fills all orders promptly. Owing to the extraordinary increase in price of most of the materials used, Mr. Roche has been compelled to advance his price somewhat, but assures his patrons that when materials come back to old lines of cost he will give them the full benefit of it. Absolute reliance can be placed in these cells, it is said, for telephone, electro-medical and cantry work, and in fact for all work that a regular open-circuit cell will do.

Schmidt & Bruckner Novelties.

The Schmidt & Bruckner Electrical company of New York is introducing several novelties which are attracting particular attention among western buyers. Prominent among these is an adjustable telephone arm for which no connection cord whatever is required. Two strong steel rods complete the circuit to the base connections through the side flanges at the socket. The No. 100 desk telephone has an automatic hook-switching device that will stand rough usage. The company's new combination microtelephone and stand has the switching connection in the base of the stand, like the regular desk type. There is no clip on the combination microtelephone to press in order to throw the battery on the transmitter. As the microtelephone is laid across the forks it pushes down a long hard-rubber button projecting from the upright tube, and thus operates the switch in the base.

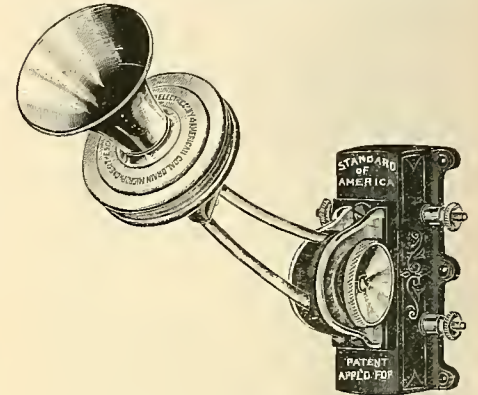
Lamber Schmidt and Frederick C. Bruckner, who control this company, learned the art through many years of practical experience with the Western Electric, Bell and independent telephone manufacturing and construction companies. The company manufactures complete exchange telephone apparatus, as well as several types of automatic intercommunicating and private-line sets, transmitters, receivers and switchboard parts.

THE TELEPHONE TRADE.

C. P. Platt, representing the American Electric Telephone company of Chicago, is in Havana with the view of introducing the American equipment into the Cuban capital.

One of the signs of the present good times is the busy condition of the Okonite factory. Okonite is a wire that long ago won its position in the electric-light business, and its reputation stands it in good stead in the rapidly growing field of independent telephony, for the independents are now going gradually through the change to strictly high-class construction. It is in the remodeling of exchanges and the production of new ones along the conservative line that Okonite's merits tell.

Mathias Klein & Son of Chicago, manufacturers of climbers for telephone and telegraph linemen, report a gratifying increase in their business. It may not be generally known that this firm has built up an excellent trade and is now doing business in every part



SCHMIDT & BRUCKNER NOVELTIES.

of the United States. Although taxed to the utmost capacity the firm is still giving full value as in the past. The firm also handles construction tools, and those in need of goods of this character may find it to their advantage to get the firm's catalogue.

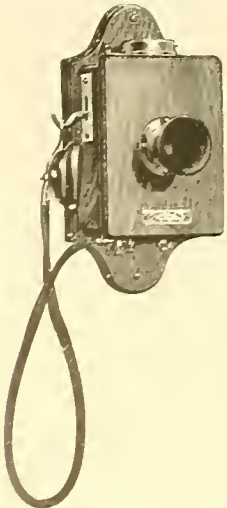
General Manager L. F. Requa of the Safety Insulated Wire and Cable company of New York is to be congratulated on a business that has continued remarkable in its growth up to the present time. The Safety telephone wires and cables have been for years standards in the general telephone field and so well appreciated in older telephone circles that the independent people have naturally followed with a great business. The Safety company refers to both independent and Bell companies as to the splendid service of its cables.

The Taber & Mayer company of Boston was started in the early part of 1895, or at the very beginning of the independent telephone business, as a partnership. While it has not grown as large as some concerns in the intervening time, it has, nevertheless, gained the reputation of producing goods of the very best quality only. In 1898 the business was incorporated as the Taber & Mayer company. The capacity for output as well as factory floor space was at the time trebled. The concern is strictly a manufacturing one, producing all the parts as well as complete instruments. V. A. Mayer is president and E. S. Taber is treasurer.

An increased spring demand for telephone material is very evident to the Central Electric company of Chicago. The prevailing higher prices on

line drops are of the Western self-restoring removable type. The line terminals connect at the back directly to the tip and sleeve springs of the spring-jack, either by a screw or soldered connection. The drop coils are wound with a large-sized wire, thus insuring complete protection against burn-outs, as the drop coil will carry enough current for a sufficiently long time to blow an ordinary one-fourth ampere fuse.

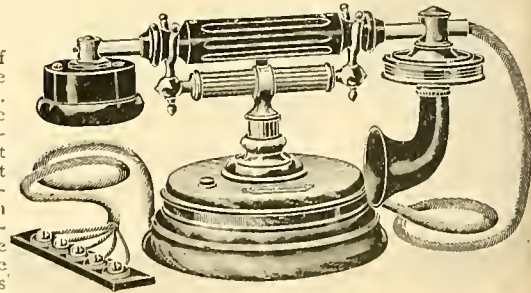
Another point not to be lost sight of is the self-restoring feature contained in the Western drop, the annunciator shutter when announcing a call being suspended before the corresponding line-jack in such a manner that it is returned to its normally horizontal position when the answering plug is introduced into the line-jack. This is said to be the only practical self-restoring drop yet produced, and it has been



JONES SPECIAL TELEPHONE SET.

identified with the Western company's switchboards for years.

The board is further equipped with Western platinum-contact circuit-changers, highly efficient tubular bridging clearing-out drops, double-pole triple-magnet head receiver, "Keely A" adjustable transmitter and supporting arm, double-conductor spiral-protected linen-braided connecting cords, Keely magneto-generator, buzzer, etc. The company's patrons express their appreciation of this board by



SCHMIDT & BRUCKNER NOVELTIES.

construction material to-day, compared with a year ago, seem rather to have stimulated business, than depressed it. Low rates of interest compel the seeking of new investments; hence, in any field where good profits are assured at nominal risks great activity will prevail. The telephone field is practically untouched in the smaller towns, and therefore the Central people look for a very large and profitable development in this line. This demand must be figured in addition to the regular needs of existing ex-

changes, and also after making due allowance for the requirements of the very strong independent movement.

E. J. Noblett of Chicago, manufacturer of special woodwork for telephone and electrical construction of every description, announces that he has secured the contract for 1899 for cross-arms, pins, brackets, etc., from the Central Union Telephone company. Mr. Noblett is to be congratulated in securing so excellent an order. The fact that this contract was awarded to Mr. Noblett in spite of close competition speaks volumes for the excellence of his products.

The Sterling Electric company of Chicago, which manufactures telephone-exchange equipment for independent companies similar to that used in Bell exchanges, passed its first year's milestone in February. It has doubled its machinery plant during the last month, being compelled to do so to handle the increasing business. The Sterling company has been working night and day for the last 30 days, and Manager Doolittle states that it will have to work night and day shifts for the next three months to fill the accepted orders now on hand. The independent telephone companies are showing their appreciation of apparatus that is standard, having the manifest advantage of the Bell company's experience.

The recent incorporation of the North Electric company of Cleveland and the removal of its plant to the spacious quarters at 61 to 71 Frankfort street suggest what enormous strides have been made in the independent telephone field alone during the last decade. The company was established on a small scale and has developed a full line of telephone apparatus. This company makes in its own factory every part that goes into the construction of a telephone system. The officers are: President and general manager, C. H. North; vice-president, D. B. Wick, president of the Wick Banking and Trust company of Cleveland; secretary and treasurer, George C. Steele, formerly secretary and manager of the Painesville (Ohio) Telephone company.

One of the most essential features of an up-to-date telephone system is a thoroughly reliable terminal and distributing box, which, if properly equipped, saves many hundred dollars of expense to a telephone exchange. The device affords the most satisfactory method of inclosing and protecting the ends of telephone cables, and gives means of testing the conductors. If properly fused, it also serves as an effective lightning arrester. The Western Electrical Supply company of St. Louis is offering to the trade, in connection with its excellent assortment of telephone supplies throughout, what is termed the Moon terminal head or distributing box, which is thoroughly equipped to satisfactorily overcome all of the objectionable features which have been experienced in some makes of distributing boxes. One of the principal features of this fused box is the arrangement of the fuse connection, which gives a fuse $3\frac{1}{2}$ inches long, although the distance between the terminals is only one inch. It is said that this terminal box has given excellent satisfaction wherever it has been used. The company has sold a large number of these terminal boxes throughout the West and Southwest.

In a recent and characteristic letter from Mr. J. J. Nate, the manager of the Standard Telephone and Electric company of Madison, Wis., these interesting passages occur: "Notwithstanding low prices, strong competition and the fact that we are not located in Chicago, we are doing a grand, good business. Our mail orders are phenomenal, and our goods seem to recommend themselves to prospective purchasers everywhere. The writer has just returned from an extended trip of two months throughout the South and East and reports some very flattering orders as a result. Our exchanges everywhere are in A1 condition, giving first-class service. It is pleasing to note that the apparatus which we put upon the market five years ago is still satisfactory to the people who have been our customers and friends from the beginning. Financially the company stands without blemish, and has discounted its bills almost from the first month of its existence. Prospects for this year's trade are even brighter than the outlook for preceding years, and we anticipate some excellent business in the coming months. We have introduced many new and worthy devices in the way of auxiliary apparatus and have recently put upon the market a new standard duplex switchboard, which is in every way an improvement over our product put out heretofore in the same line, and is meeting with favor everywhere. An exchange of 800 numbers, employing this board and our Standard Milde instrument, recently installed at Asheville, N. C., has been a revelation to the people in that part of the country. The subscribers at Asheville refer to the 'new telephone' as 'the instrument over which you can hear a watch tick clear across the town.' Our exchanges are growing and increasing in popularity with subscribers everywhere. It has not been our policy to sacrifice all our profit in an effort to put our goods upon the market, nor do we ever intend to do so. When that time comes, we shall be glad to invest our money in exchange plants, as the revenue there seems to be without question eminently satisfactory to investors."

The Harrison primary cell No. 1 is making itself felt, especially in the West, among those desiring a cell of the "very best." Large orders have been coming in of late to the Thermo-electric company, Times building, New York, and one for 500 cells for

regular supply trade has just been received. The features that seem to please users most are the extraordinarily high electromotive force of the cell and its capacity. This cell is practically a new departure in primary cells, for, while peroxide of lead has long been used in connection with storage batteries, it has, the company claims, never before been successfully used in a primary cell. "The combination of lead peroxide and zinc amalgam as elements," the manufacturers, Harrison Bros. & Co. of Philadelphia, claim, "with dilute sulphuric acid as the electrolyte, gives the highest electromotive force (2.45 volts) obtainable in a practical primary cell. The quick depolarization obtained by the use of specially prepared lead peroxide, along with the low resistance of the electrolyte and its high voltage, makes the Harrison cell the most powerful of the open-circuit type known. Its recuperative powers are phenomenal, and the amount of work it will do is extraordinary when its size is taken into consideration. The small dimensions of the cell—it is only five inches high by three inches square—is one of its commendable features. Where space is a consideration the Harrison cell is most suitable, as it occupies only a fraction of the room required for the usual type of open-circuit wet cell. The ratio is about one to six for the same output. Its high voltage reduces by more than one-half the number of units required for a given purpose, when compared with the usual type of open-circuit cell. The absence of creeping salts and corroded connections, its non-liability to destruction by short-circuiting and freedom from freezing in cold weather, along with the cheapness of its maintenance and renewals, are strong points in its favor." It is estimated that the cost of the electrical energy obtained from this cell is about one cent per watt-hour. This battery will, it is said, give on ordinary open-circuit work a discharge of 40 ampere-hours, or over 80 watt-hours.

One of the latest companies to enter the independent telephone field, and one that is likely to make itself strongly felt as a factor in this rapidly growing industry, is the United States Automatic Telephone company, which was recently incorporated under the laws of the state of New York, with a preliminary capital of \$1,000,000. This company has acquired the basic United States patent granted to the well-known electrical engineer, Mr. Elias E. Ries of New York city, upon a new automatic-telephone system of his invention, which evidently not only constitutes a radical departure in telephone work, but promises to greatly cheapen the art and practice of telephony by reason of its remarkable simplicity, low cost and convenience, and its unusual promptness and efficiency, as compared with the ordinary systems now in vogue. The distinguishing feature of the Ries automatic-telephone system is that it dispenses entirely with the hook switch, magneto-generator, drop switchboards and other complex and troublesome features of existing telephone systems. The subscriber's apparatus has been reduced to such a state of simplicity that nothing is left for him to do but listen and talk. The instrument does the rest. It is said that the new apparatus can be furnished at less cost than any apparatus of equal grade hitherto manufactured. The United States Automatic Telephone company, with offices in the New York Life building, 346 Broadway, New York city, proposes to enter into the manufacture of telephonic apparatus embodying the various features of its system, and to introduce the same under license arrangements through existing independent telephone companies, as well as through new sub-companies to be formed by it for the purpose in the various sections of the United States. The incorporators of the parent company and its temporary officers are Messrs. Elias E. Ries, Israel Steinhart, Martin Lowenstein, Henry J. Furlong and H. A. J. Wilkens, all of New York. The company will shortly elect permanent officers, and, it is believed, will add to its board of directors a number of prominent gentlemen who are largely interested in the telephone industry in addition to those already named.

EXTENSIONS AND IMPROVEMENTS.

A new telephone line is about to be built to Point Wilson from Port Townsend, Wash.

It is rumored that the Hughes Telephone company will put in an exchange at Hillsboro, Ore.

The Oregon Telephone company is putting in a local telephone service for Hood River, Ore.

The Sunset Telephone company is putting in a local telephone system at Cottage Grove, Ore.

D. C. Demarest has been granted a franchise to construct a telephone line from Altaville to Jamestown, Cal.

A franchise for a telephone line from San Diego, Cal., through Roseville, was granted to the United States government.

At San Andreas, Cal., an ordinance was passed granting D. C. Demarest a franchise to construct and operate a telegraph and telephone line along streets of the county.

The Inland Telephone company will erect a \$75,000 office building at Spokane, Wash. As soon as the new office is in operation all the old-style telephones over the city will be replaced with the express system.

H. F. Fiecher and the C. and E. have turned over their private telephone lines in Corvallis, Ore., to the Oregon Telephone company, which will connect those lines with its system. The company is at

present engaged in putting up a considerable amount of new wire.

Manager W. H. Dancy, local manager of the Oregon Telegraph and Telephone company at Salem, has been informed that the company will at once begin the construction of a line between Salem and Mount Angel.

A telephone system using the National Automatic Telephone company's instrument will be installed in Rankin, Ill. The National Automatic Telephone company is installing an interior automatic-telephone system for C. D. Heath & Co., 378 Wabash avenue, Chicago.

The managers of the Southside Telephone company, which operates a telephone service from Long Beach to Roslyn, have purchased the franchise and property of the defunct Long Island and New York Telegraph company, and it is proposed to extend the service of the Southside company through Long Island. The Long Island and New York Telegraph company conducted a telephone line between East New York and Far Rockaway and Rockville Center. At the latter place the wires of the Southside company will be connected with those of the other company, and it is said that in a short time Babylon and Patchogue will be on the line of the company. The Southside telephone service, on a limited basis, costs \$15 a year.

EXCHANGE MANAGERS.

Dr. I. A. Lumpkin of Mattoon, Ill., who has been ill for several weeks, has returned to his home completely recovered. Dr. Lumpkin reports that the independent interests throughout the state are becoming much better organized and are extending their lines in every direction. The Bell interests are endeavoring to secure control of certain points for the purpose of breaking the connections of toll lines, but thus far they have not succeeded in seriously affecting the service.

Simon P. Sheerin of Indianapolis, who is an active force in the onward march of independent telephony, is a self-made man a little over 50 years of age. He obtained his education in the public schools and the printing office. He dabbled in politics early in life, and when only a little beyond his majority was elected to a county office as a Democrat. He edited the *Logansport Indiana Pharos* for many years, served as a member of the state executive committee of his party, was elected clerk of the Supreme Court of Indiana and served acceptably for four years and declined a renomination. His motto as to political service is, "While it is a pleasant experience to be honored by one's fellows with public office, no man should be continuously in politics for a livelihood." Mr. Sheerin was the Indiana member for eight years on the Democratic National Committee, and was during the entire time the secretary of the committee. He has been largely identified with many important interests, notably the development of the great natural-gas interests, having been largely instrumental in the piping of gas to all the larger cities of his state.

George W. Beers is regarded as an old-timer by independent exchange managers. He was born in Ohio, in which state he continued his residence until six years ago, when, to be nearer the center of his business activities, he removed to Fort Wayne, Ind. His telephone experience began in 1880 with the Midland Telephone company, at that time the licensee of the American Bell Telephone company, having exchanges at several points in Ohio. The company was absorbed with other licensees of the American Bell, forming what is now the Central Union Telephone company, operating throughout Ohio, Indiana, Illinois and Iowa. Upon the organization of the Cincinnati, Van Wert and Michigan railroad, Mr. Beers left the telephone service to become the constructing engineer of that line. The road was built, and is now a part of the Cincinnati Northern railroad, between Cincinnati and Jackson, Mich. The telegraph lines along the Cincinnati, Van Wert and Michigan railroad in Ohio, Indiana and Michigan were constructed and operated by the Edison Mutual Telegraph company, an Ohio corporation, of which Mr. Beers was the secretary and treasurer up to the time the lines were acquired by the Western Union Telegraph company. About this time the basic telephone patents expired, and Mr. Beers engaged in independent telephone enterprises in 1894, organizing and putting into operation successively the exchanges at Decatur, Ind.; Van Wert, St. Mary's, Wapakoneta, Lima and Delphos, Ohio; Fort Wayne, Ind.; North Baltimore, Ohio; Auburn and Kendallville, Ind. He is now particularly interested in the exchange of the New Telephone company at Indianapolis, which he believes will be equal if not superior to any telephone exchange in the country. Mr. Beers was among the first to recognize the necessity of out-of-town connections for the local exchanges, and he quickly saw the utility of establishing connections upon the co-operative plan between exchanges; therefore, in 1895 he organized the National Telephone and Telegraph company, of which he is the president, and through the medium of that company's lines all of the exchanges, together with the small towns in Indiana lying north and east of Indianapolis, and those in Ohio lying south and west of Toledo, have been connected, comprising the most complete independent telephone system yet inaugurated.

MANUFACTURERS AND DEALERS.

William E. Sundberg, general manager of the Reliable Electric Manufacturing company, was born in Stockholm, Sweden, in 1871, and was graduated from the Polytechnic Institute of Stockholm in 1892. For six years he has been connected with telephone exchange and manufacturing work. He is the inventor of several mechanical and electrical devices.

William J. Murdock of the firm of William J. Murdock & Co. of Boston has been identified with the telephone business in the East for several years, having been connected with the Electric and Machine company of Boston from 1887 until 1895, when he began manufacturing telephones. The firm of William J. Murdock & Co. is the manufacturer of the "M" bipolar receiver.

Independent telephone men will be interested in the announcement that R. E. Weed has been recently appointed secretary and treasurer of the Victor Telephone Manufacturing company, Chicago. Mr. Weed is one of the many energetic young men in the telephone business, and has shown conspicuous ability in the discharge of the duties of his position. The Victor company has been exceptionally successful in the telephone field, and this is due in great measure to the abilities of the staff which Mr. Weed so worthily represents.

J. A. Williams is well known in the independent telephone field, having first engaged in the manufacture of magneto bells for the independent field five years ago, with the Williams-Abbott Electric company, which he founded. About one year ago Mr. Williams disposed of his interest in the company, and in connection with B. S. Chamberlin and other Cleveland capitalists formed the Williams Electric company for the purpose of manufacturing telephone apparatus for the independent field. The success of Mr. Williams in his new undertaking is attested by the fact of the enormous business that the Williams Electric company is now doing in the complete telephone apparatus.

F. J. Dowland of Ludington, Mich., has for many years been the secretary of the Pere Marquette Lumber company, and has held several terms as mayor of the city of Ludington. With the decadence of the lumbering interests of Northern Michigan, Mr. Dowland turned his attention to other lines of work, and accepted the presidency of the Mason Telephone Pay Station company. He has recently been re-elected president of the company, and is giving to it his ripe experience as a business man. This company has a very accurate and ingenious appliance for the automatic collection of tolls, invented by H. R. Mason of Ludington, and sold to this company by him. It is intended for use in hotels, depots, drug stores and public buildings.

Mr. A. M. Taylor, well-known inventor and telephone expert, has become associated with W. H. Butler in the Butler-Taylor company of Ravenna, Ohio. Mr. Taylor is one of the pioneers in the independent telephone movement, having built and managed some of the first independent exchanges in the country. Mr. Taylor has invented a number of useful devices that have been of great advantage to the independent telephone people. He is a thorough mechanic and an up-to-date construction man and telephone manager. He has derived his knowledge of telephone business by practical experience, and his judgment on construction work and general telephone business is to be relied upon. The Butler-Taylor company will manufacture lightning arresters and several other new inventions of Mr. Taylor. Mr. Butler is a business man of means and the success of the company is assured.

Elias E. Ries, who is exploiting the United States Automatic Telephone company of New York, was born in Germany in 1862 and was educated in the technical schools of New York and Baltimore. He took up the study of telegraphy in 1876, practicing as an operator with the Gold and Stock and Western Union Telegraph companies and making a number of valuable improvements, some since patented. In 1881 he entered the service of the United States Electric company, in the mechanical and lamp departments and in dynamo construction, and later engaged with the Fuller Electric Light company and with Bergmann & Co. in experimental work connected with the Edison system of electric lighting. Mr. Ries is an actively interested member of the American Institute of Electrical Engineers, the American Association for the Advancement of Science and the American Association of Inventors and Manufacturers.

The Stromberg-Carlson Telephone Manufacturing company of Chicago has recently added above \$5,000 worth of heavy machinery and improved tools and made arrangements for doubling its factory space to be in position to fill the orders it has on its books at the present time. Among the unfilled orders is the equipment for a 5,000-capacity, semi-multiple switchboard and central-energy telephones for Minneapolis and one of similar character for St. Paul; a 1,500-capacity strictly multiple switchboard and central-energy system for Waco, Texas; a 600-capacity trunking switchboard and central-energy telephones for Parkerburg, W. Va.; a 200-capacity central-energy equipment for North Vernon, Ind.; a 200-capacity central-energy equipment for Chicago, Mich.; a 100-capacity central-energy equipment for Milford, Ill.; besides many orders for the regular exchange apparatus and special toll-line

switchboards and toll-line telephones with new and improved generator.

The Farr Telephone and Construction Supply company of Chicago has enjoyed success from the beginning of its existence. Charles W. Farr, the president of the company, was born in Port Huron, Mich. He engaged with the Western Union Telegraph company in 1871, and served with that company as local manager until 1889, when he resigned his position. During the last ten years of service with that company he acted as local manager for the Bell Telephone company, filling two very responsible positions to the entire satisfaction of both companies. Thinking there was a greater prospect for advancement in the electrical field, he came to Chicago in 1892, and soon after founded the company which bears his name. Mr. Farr has had experience in telephone construction from climbing the poles and stringing wires to the finest switchboard work. The Farr company manufactures everything in the telephone line, and the excellence of its product has given it an enviable reputation. The principles of honesty and fair dealings, which Mr. Farr and his associates have always followed, have gained the confidence of their customers.

Among the telephone men who have gained distinction C. H. North occupies a conspicuous position. His education fitted him for mechanical and electrical work, and he has supplemented it by practical experience. He was engaged with the Akron, Canton and Massillon Telephone company in 1881, and later with the Cleveland Telephone company until the spring of 1887, at which time he withdrew in order to devote his energies to an enterprise he had started in 1885 for repairing and remodeling the switchboards, telephones and magneto bells of the Erie Telegraph and Telephone company. Mr. North invented a machine for cutting mechanically perfect gears, which enabled him to turn out a magneto-generator as noiseless and accurate in adjustment as a watch. His ringing and listening key, first used on the Bell switchboards, was an ingenious device. The first independent exchange built and installed by Mr. North was at Garrettsville, Ohio, in 1893. Among novel features of the North Electric company's new switchboards, the self-restoring drop is particularly praiseworthy. The company's protecting devices for switchboards offer new and valuable features.

Notwithstanding the fact that the Victor Telephone Manufacturing company has been in existence for less than a year, it has gained a position among the leaders. It has placed its apparatus in every section of the country. This is due almost entirely to the able management of its president, William T. Blaine, who has by hard work and perseverance piloted the company to its present state. The company has recently added to its list of apparatus a central-energy system. Ernest E. Yaxley, the superintendent and electrical engineer of the company, was born in 1860, in Hillsdale, Mich. Mr. Yaxley soon developed a tendency toward the mechanical arts, and in order to gratify his inclination, at the age of 16 years, he entered a machine shop as apprentice. His advancement has been rapid and continuous. Mr. Yaxley soon realized that the telephone field gave great opportunities to his abilities, and about 1891 became identified with the development of the Strowger automatic system. It was in the spring of 1898 that the Victor Telephone Manufacturing company was organized to promote Mr. Yaxley's valuable inventions in the way of telephone apparatus. Although in existence hardly a year, the company is already at the foremost rank of the independent manufacturers, which is undoubtedly due to the excellent quality of Mr. Yaxley's devices, coupled with the high executive ability of Mr. William T. Blaine, the company's president.

Maximum Telephone Rates for New Jersey.

The New Jersey Legislature is considering Assemblyman Murray's bill providing for the regulation of telephone rates throughout the state, the maximum figures being as follows: In cities of over 100,000 population, \$50 a year; in cities of from 20,000 to 100,000 population, \$40 a year; in places under 20,000 population, \$30 a year. The attorney-general, the controller and the secretary of state are constituted a board to hear appeals, with power to modify these rates where they prevent a company from earning 10 per cent. on its capital stock and bonds.

Assemblyman Murray declared that these rates were based upon the charges that obtain where competition has forced the Bell company to meet public demands. The Bell company has given service at a profit when charging only \$3 a month for a telephone in a business house and \$2 a month for service in a private house. In Trenton, Newark, Jersey City and Elizabeth rates had been reduced by such competition, but in Plainfield the charge is \$125 a year for a business place and \$60 a year for a private house, as against \$36 and \$25 respectively, in Newark and Trenton. Considerable data collected by a telephone manager who had had much experience in such matters was submitted for the consideration of the members.

A representative of the independent company operating an exchange in Jersey City and Bound Brook protested against the bill on the ground that it would drive the local companies out of business. They have never paid dividends on their stock, he said, but

paid the interest on their bonds and allowed a reduction of eight per cent. on the telephones used by stockholders. He said that Plainfield suffered from high prices because it would not grant a franchise to a competing company and so protected the Bell monopoly. The committee seemed inclined to think that competition sufficiently regulated prices. Further hearing will be given the conflicting interests before decision is reached.

Wolf River Telephone Lines.

A. L. Hutchinson, secretary and treasurer of the Little Wolf River Telephone company, is arranging to connect Fond du Lac, Wis., with Oshkosh, Ripon, Berlin and several other points in that part of the state. Mr. Hutchinson announces that the franchise in the city of Fond du Lac granted to F. H. Sweet and Waldo Sweet several years ago has been transferred to the Little Wolf River Telephone company of Weyauwega.

In March, 1895, the Wolf River Telephone company was incorporated with a capital stock of \$1,200 for the purpose of building a toll line to Tusten from Weyauwega, a distance of 17 miles. The company increased its capital stock to \$6,000, extended its lines from Weyauwega to New London, and put in a local exchange in New London.

In 1896, as some of the stockholders were opposed to further extensions, E. H. Jones, A. L. Hutchinson and H. E. Kepler, an electrical engineer from St. Louis, organized the Little Wolf River Telephone company, with a capital stock of \$6,000, built from Royalton to Symco, a distance of 10 miles, and put in a small exchange in Manawa. In January, 1898, E. H. Jones sold his interest in the Wolf River company to A. L. Hutchinson, who immediately commenced operations to extend the business of the lines and secure connection with the Oshkosh Northwestern company. E. H. Jones then transferred his interest in the Little Wolf River company to Mr. Hutchinson. In May, 1898, the capital stock of the Little Wolf River company was increased to \$15,000. The company on May 21st had Oshkosh and Omro connected. An exchange was built in Omro and the lines extended north to Weyauwega. Franchises were also secured in Winnecone, Hortonville, Clintonville, Tigerton and Wittenberg. Work has been continued without interruption to the present time; lines have been extended to Berlin, where connection is made with the local company; an exchange has been built to Clintonville, and by March 15th the toll lines will be complete to Wittenberg. A contract has also been made with the local company in Ripon, through which city the lines will be extended to Fond du Lac.

The Wolf River company and the Little Wolf River company are operated as one system, known as the Wolf River lines.

The lines are nearly all metallic circuits, and good service is given. The toll rates are about one-half those of the old company, while the time limit is raised from three minutes to five minutes. The rates for telephones in exchanges are also about one-half the rates of the old company. As an instance of what business these lines are doing, Mr. Hutchinson says: "When I contracted to connect with the Oshkosh company they demanded a guarantee of 500 messages per month, which I readily consented to give, as I had faith that the business would be far in excess of that number of messages. We did not complete connection with Weyauwega till about the first of December, and Berlin was added the first of January in the present year, and yet the reports show that in January the number of messages to and from Oshkosh amounted to 685 paid messages."

At its annual meeting the capital stock of the Little Wolf River company was increased to \$60,000 and that of the Wolf River company to \$8,000.

The Wolf River company paid a dividend of seven per cent. in 1897 and 12 per cent. in 1898. The Little Wolf River company paid a dividend of 10 per cent. for 1898, which was remarkable, as the lines were not completed for through business till late in the season.

New England Telephone News.

[FROM THE BOSTON CORRESPONDENT OF THE WESTERN ELECTRICIAN.]

The American Bell Telephone company has bought the estate on Oliver street, in Boston, adjoining the building in which its offices are located, paying \$85,000 for the property, which has a one-story building upon the land at present. It is stated that the purchase is made for the purpose of increasing the facilities of the New England Telephone company, the Bell's Boston branch, which has headquarters in the company's building, and a new building will soon go up on the site, connected with the present nine-story structure.

Much interest has been taken by the people of Boston in the bill now before the Legislature providing for supervision of telephone business in Massachusetts, in a manner similar to the oversight now exercised in relation to the gas and electric-light companies. At the hearings the committee rooms have been crowded, and the original place of meeting had to be changed to a larger one to accommodate the spectators. The only important opposition thus far developed has been voiced by the attorney for the Bell interests. At a meeting last week of the Massachusetts Associated Boards of Trade the project of state supervision was indorsed, and a committee was appointed to urge the passage of the bill. Lynn and

Brockton boards of trade have also requested the representatives in the Legislature from those cities to vote in favor of the measure.

Electricity at the Omaha Exposition.

[Special correspondence of the WESTERN ELECTRICIAN.]

OMAHA, March 6.—The electricity section at the Greater America Exposition at Omaha this year will present an array of attractions both varied and unique. The Electricity and Machinery building, which is now ready to receive exhibits, is a very large structure, affording ample floor and gallery space for exhibits in operation, as well as a display of finished products of manufacture. It is the purpose of the managers of the exposition to show the latest apparatus and multiplicity of devices of an electrical nature and give a practical demonstration of their application to manifold uses. The Electricity building at the Greater America Exposition at Omaha is bound to attract widespread attention, as it will embrace one grand array of operating machinery interspersed with countless novelties to hold the attention of curious visitors. Manufacturers of electrical goods whose trade is drawn largely from the Mid-west discern in the Omaha Exposition a rare opportunity for exploiting their wares.

Mr. I. N. Simpson, superintendent of exhibits, says he finds extraordinary interest manifested by prospective exhibitors. He offers them space for live exhibits free, not only in the domain of electricity, but in all other branches of industry. Large reservations of space have already been made. This wonderful attraction, along with that of the colonial exhibits, argues for a very large attendance at the Omaha exhibition, which will open July 1st and close November 1st. J. B. H.

Reported Transfer of the Electric Storage Battery Company.

The New York Gas and Electric Light, Heat and Power company has certified to an increase of capital stock from \$25,000,000 to \$36,000,000. The amount of capital actually paid in is \$50,600, and the debts and liabilities are \$36,150,956.50. The certificate is signed by Henry J. Hemmens, chairman, and Frank D. Allen, secretary of the meeting of stockholders. The *New York Tribune* says that it has been understood for some time that the control of the Electric Storage Battery company of Philadelphia has been acquired by the Whitney syndicate, two members of which, Thomas F. Ryan and Anthony N. Brady, were a day or two ago elected directors of the company; and it is supposed that the increase of \$11,000,000 in the capital stock of the New York Gas and Electric Light, Heat and Power company, which corporation also is owned by the Whitney syndicate, signifies that that company is about to absorb the storage-battery company. The latter has \$8,500,000 common and \$5,000,000 preferred stock and \$450,000 bonds.

"World" and "Engineer" Combined.

Announcement is made of the combination of the *Electrical World* and the *Electrical Engineer* of New York, the latter publication having lately been acquired by Mr. James H. McGraw, publisher of the *American Electrician* and *Street Railway Journal*. Mr. Johnston of the *World* will retire from the field of electrical journalism, and Mr. Wetzler of the *Engineer* will hereafter devote his entire attention to the *Electrical Engineer* Institute.

The new publication will be known as the *Electrical World and Electrical Engineer*, and its editorial policy will be intrusted to T. C. Martin and W. D. Weaver, which will be sufficient guarantee that a high standard will be maintained. The business management will be directed by James M. Wakeman and A. C. Shaw.

The combination, it is anticipated, will prove advantageous in every way for the publications interested and their patrons. Mr. McGraw and his associates are to be congratulated upon the arrangement.

Dinner to W. E. Baker.

On Monday evening, March 6th, Mr. William E. Baker, late superintendent of the Metropolitan West Side Elevated Railroad company of Chicago and now general superintendent and chief electrical engineer of the Manhattan Railway company of New York, was the guest at a quiet dinner given in his honor by some of his Chicago friends at the Union League Club. Besides Mr. Baker the gentlemen present were Messrs. B. E. Sunny, S. P. Wells, B. J. Arnold, Theodore P. Bailey, J. B. Allen, F. H. Clark, James R. Chapman, S. S. Neff and Frank Hedley. Everybody had something pleasant to say of Mr. Baker, in view of the important work he is to take up in New York, and he was wished the greatest measure of success. A few days ago the employes of the Metropolitan company gave Mr. Baker a handsome silver loving cup as a farewell souvenir, and this cup was used with discretion and admired without limit at the Union League dinner.

Chicago Electrical Association.

An interesting paper on "Patent Systems of the United States and Foreign Countries Compared" was presented before the Chicago Electrical associa-

tion by W. Clyde Jones on March 3d and was received with considerable attention. This organization has given more thought to patent regulations than any other association in the country that is not strictly of a legal character, and for that reason alone the paper commanded attention. Mr. Jones treated the subject in a masterful style, and his views will doubtless receive the consideration to which his experience and ability entitle him.

CORRESPONDENCE.

New York Notes.

NEW YORK, March 6.—After 16! these many years the Manhattan elevated railroad system in this city is to be equipped for the electrical operation of the trains. The matter was finally and officially settled at a stockholders' meeting held on February 28th, at which these resolutions were adopted without opposition:

Resolved, That the proposition to increase the capital stock of the Manhattan Railway company, contained in the notice pursuant to which this meeting is held, be and it hereby is sanctioned and approved, and that the capital stock of the Manhattan Railway company be increased from the present amount thereof, to wit, \$50,000,000, consisting of 500,000 shares of the par value of \$100 each, to \$115,000,000, to consist of 450,000 shares of the par value of \$100 each.

Resolved, That the stockholders of the Manhattan Railway company approve the proposed action of the board of directors, that the funds derived from the sale and distribution of the additional capital stock authorized at this meeting shall be expended and used primarily to substitute electricity in the place of steam as the motive power on the railways of the company, and to provide new plant and equipment, and for the enlargement and improvement of its system, and all other requisite facilities, to the end that the company may furnish the public a service of the greatest possible efficiency, speed and comfort; that such improvements be begun immediately, prosecuted with vigor and completed as soon as practicable, and that any surplus of said funds not needed, in the opinion of the board, for these purposes be used for any authorized corporate purpose.

It will thus be seen that the company will be amply supplied with funds to carry out the work which Mr. Baker has been imported from Chicago to supervise. Mr. Gould referred to the Tammany "raid" on the company at the stockholders' meeting and noted that it was begun at the time the Manhattan company failed "to comply with a demand made on behalf of the New York Auto-truck company to enter into a contract with that company to let it fasten its pipes on the entire railway structure of this company for a nominal consideration." Mr. Gould added that the company confidently relied upon the support of the public in its policy to make improvements, and that the stockholders could rest assured that the hostile demonstrations on the part of the city officials would not be allowed to delay the proposed improvements for a single day. It begins to look now as though the bottom had dropped out of Tammany's "holy war" on Manhattan. The drip-drip ordinance, to which I referred last week, has been withdrawn from the mayor by the Municipal Assembly and referred to a committee. The mayor has as yet taken no action on the ordinance to compel the company to run trains at intervals of five minutes or less through the 24 hours, although he gave a public hearing on the subject on March 1st. Most significant of all, Mr. Croker admitted to a *Sun* reporter on Friday that the Municipal Assembly has no authority over the Manhattan company. One interesting statement recently made by the Tammany chieftain was to the effect that he had been informed that Professor S. H. Short, now in Europe, had once examined the Manhattan structure and had reported that it was not strong enough to bear the weight of the electrical system.

There are persistent rumors of a consolidation of the Metropolitan and Third Avenue street-railway surface systems, but officers of both companies make positive denials. Mr. Whitney is reported to have said that "There is nothing in the story whatever. There have been no negotiations of any kind, nor has there been, nor will there be, any sort of agreement entered into."

Counsel for the Edison, Citizens' and Municipal Electric Light companies of Brooklyn have filed claims amounting to more than \$500,000 against the city of New York for lighting the borough of Brooklyn for part of 1897, 1898 and January of this year. It is said that the bills have been "held up" by the Municipal Assembly.

The announcement is again made that the negotiations for the consolidation of all the transportation companies in Brooklyn, including not only the surface trolley roads, but the two elevated roads, are progressing in a most satisfactory manner, and that within six months the consolidation will be effected.

M. S.

PERSONAL.

The will of Jesse H. Bunell, who died last month, was filed for probate in the office of the surrogate in Brooklyn. The estate, valued at \$300,000, is left to his widow and sons.

Mr. Samuel L. Naphtaly, the manager of the Central Light and Power company of San Francisco, was in Chicago for a few days last week in the interest of his company.

Francis H. Drake, director of the electricity and machinery department of the United States commission at the Paris Exposition, will sail for Paris to-day. He will return on April 15th.

F. S. Terry, now with the Weston Electrical Instrument company, has been in Chicago for a week

looking after his interests here. Mr. Terry, needless to say, was warmly welcomed by his old friends in the electrical fraternity of Chicago.

Mr. Albert Scheible will deliver a paper entitled, "Electric Street Lighting of Yesterday and To-day," before the Chicago Electrical Association in its rooms, 1736-1741 Monadnock building, on the evening of March 17th. Everyone interested in the subject is invited to attend the meeting. A general discussion upon the subject will be held after the reading of the paper.

Mr. William Hood, well known to the electrical fraternity of Chicago and the West, has become the representative in Chicago of the Oklahoma Cement and Plaster company of Cleveland, of which Mr. L. H. Rogers, formerly with the Brush, Adams-Bagnall and Fort Wayne Lamp companies, is treasurer. Mr. Hood has the cordial good wishes of his electrical friends in his new departure.

Mrs. Elizabeth Beach of Evanston, Ill., died in San Francisco on March 2d. Mrs. Beach was the widow of Franklin G. Beach, the pioneer telephone man of the West and general manager of the Central Union Telephone company of Chicago at the time of his death on April 28, 1897. The deceased lady left Evanston on February 20th to visit the family of John I. Sabin in San Francisco. Her only living relative is a sister, residing in New York.

Mr. H. F. J. Porter of the Bethlehem Iron company lectured to a large audience at the recent meeting of the Society of Arts, Massachusetts Institute of Technology, Boston. His subject was "Modern Forging," and he presented in a very interesting way, with numerous illustrations by the stereopticon, the methods in vogue at the Bethlehem works of forging such articles as hollow and solid shafts, dynamo field rings, guns and armor plate. Views were shown of the hollow shafts of the Oregon and of the Brooklyn, made at these works. Defects in the old methods of forging and the steps leading to the present methods were well explained.

ELECTRIC LIGHTING.

The city of Astoria, Ore., is contemplating the erection of an electric-light plant for the purpose of lighting the streets of the city.

The electric-light plant at Tampico, Mexico, has been purchased by T. C. Henry and associates, who will replace it with a first-class modern establishment.

The town of Williams, Ariz., will soon be lighted by electricity. The main owners of the plant are J. C. Boyce and J. C. Brown. The plant is almost completed.

J. Pierpont Morgan, the New York banker, has promised to contribute £5,000 to the cost of establishing an electric illuminating system in St. Paul's Cathedral of London.

The Jamestown (Cal.) Electric Light company has sold its system to the Tuolumne Electric Light and Power company, which will use it to furnish light and power for Jamestown, Quartz Mountain, Stent and vicinity.

W. S. Smith, an expert electrician, rendered report to the city authorities of Portland, Ore., furnishing estimates of cost of erecting and operating a plant of sufficient capacity to light the city. The total cost of the plant is estimated at \$174,425.

It is said that Anthony N. Brady, representing a syndicate of capitalists, has purchased the Equitable Gas and Electric company of Utica, N. Y. The company is capitalized at \$400,000, and it is said that the stock was sold to the new owners at above par.

Henry Vogel, a saloonkeeper at Clark and Michigan streets, Chicago, was convicted in Judge Waterman's court of stealing electricity from the Chicago Edison company by tapping the wires in the street and using the current to light his saloon. He was fined \$75.

The authorities of Springfield, Utah, have refused to grant an electric-light franchise to Davis Clarke, S. J. Norris and W. L. Harris, giving as their reason that they believe in municipal ownership, and that the council has already made some moves toward putting in an electric light plant.

A recent New York state incorporation is that of the Middleport Power company of Middleport, Niagara County, to manufacture electric light, heat and power. The capital is \$15,000 and the directors are Frank G. Lott and Thomas J. Wilcox of Niagara Falls, William J. Sterrett and George F. Thompson of Middleport and Byron C. Stanton of Sanborn.

Up in the Klondike the question of using electric lights is now to the front. The Skaguay *Askan* of January 12th says that a public meeting was held recently for the purpose of discussing the question of securing cheaper electric lights for Skaguay. Mr. Keelar, who represents those proposing to erect the new plant, says that a business combination with plenty of capital behind it will erect the plant, if the citizens will meet it half way and guarantee a certain percentage of the lights now used.

It is proposed by Mayor Harrison and City Electrician Elliott to extend the street arc lighting of Chicago by establishing additional stations in city

pumping plants now used by the Sewer Department exclusively. Some of these plants will be abandoned for pumping purposes when the new intercepting sewers are built and some will continue to serve their present purpose with electrical additions. If the plans are carried out in full 2,900 street lamps of 2,000 nominal candle power each will be added to the existing municipal equipment.

An ordinance will be introduced in the Evanston, Ill., Council to permit furnishing light and heat to residents of that city on a new plan. If the ordinance is accepted the Yaryan circulating hot water and heating system is the one that will be used. The pipes are to be laid underground with electric-light wires. Incandescent lights will be furnished at the rate of one-half cent an hour. The franchise asked is for 25 years, with no compensation except that are lights be furnished the city at a reduced rate. Homer C. Yaryan and H. M. Wisler are interested in the plan.

Senator Higgins has introduced a bill in the New York Legislature to provide for an electric-lighting plant to supply the public buildings in Albany. Ten years or so ago a lighting plant was set up in the capitol, but it was worn out when Governor Morton entered office in 1895, and had to be abandoned. A contract was entered into with the Municipal Gas company of Albany to supply the light. The political differences between William Barnes, Jr., and Anthony N. Brady in Albany last fall gave rise to a report that the lighting contract would be taken from Mr. Brady's company forthwith and a state plant set up. The bill now introduced fulfills this prediction, although it is based undoubtedly upon the more substantial reason that the state needs the plant. The superintendent of public buildings is directed to establish the plant, for which \$60,000 is appropriated. The buildings to be lighted are the capitol, state hall, geological hall and the buildings connected therewith.

William A. Linn of Hackensack, N. J., Cyrus O. Baker, Jr., of Newark and George H. Guy and Herbert B. Coho of New York city have filed articles of incorporation for the North Jersey Light, Heat and Power company, with a capital of \$100,000. They have purchased the old Red Mills property at Arcola, which has a valuable water power on the Saddle River. It is the purpose of the company to build a new dam and establish a plant for generating electricity by water power, it being understood that from 75 to 400 horse power can be obtained, according to the condition of the stream at different seasons. Arcola is on the Paramus Road, nearly midway between Hackensack, Paterson and Ridgewood, and on the route of proposed important trolley extensions. One purpose of the new company, it is said, will be to create a sentiment in favor of lighting country roads by electricity produced at low cost by water power. A steam plant will also be put in to supplement the water power when the stream is low.

ELECTRIC RAILWAYS.

An ordinance has been passed granting to George E. Leighton the right to construct and operate an electric street railway in Pasadena, Cal., for 23 months.

A Spokane paper says that the Lidgerwood electric line is to be extended from Hillyard to Cœur d'Alene Park. The proposed west extension will be 17 blocks long.

Survey of the Pacific Beach and La Jolla railroad at San Diego, Cal., has been completed, and Superintendent Flint is making up report on the work necessary to be done in electrically equipping the road.

The Los Angeles Railway company has given an order for the electrical equipment of 10 new cars. The work of cast-welding the joints of all the new rails laid by the company will be begun soon.

On February 6th the Kenosha Light and Power company was granted a 10 years' contract to light the city. The question of municipal ownership was thoroughly investigated before the order was passed. W. H. Schott, president of the company, feels elated over his success.

The Bergen County Traction company has opened its extension from Fort Lee to Bogota, N. J. The extension is five miles long, crossing the Northern and West Shore railroads above grade. During the coming summer the line will be carried across the river to Hackensack.

The Chicago, Wheaton and Aurora Railroad company has been incorporated with a capital of \$10,000, which, it is said, will be increased, to build an electric railroad from Aurora to Wheaton and from the latter place to Chicago. Andrew J. Hirschl is mentioned as an incorporator.

The February reports of the Brooklyn trolley roads show the disastrous effect of the recent blizzard on surface street-railway travel. The earnings of the Nassau Electric Railroad company were \$18,000 behind those of the corresponding month last year. This loss is directly due to the storm, which tied up many of the Nassau's lines for several days. The Brooklyn Rapid Transit company, which in January made a large increase in earnings over last year, showed for February an increase of only \$1,427 over the earnings for February, 1898. President

Rossiter says that the blizzard cost his company about \$50,000.

A bill has been introduced in Congress for the extension of the lines of the Maryland Suburban Railway company into the District of Columbia. Electrical equipment will be used, and both passengers and freight will be carried. The sub-extension is to be commenced within one year and completed within two years of the date of the passage of the act, under guarantee of \$1,000, which amount and charter are to be forfeited upon failure to complete the extension within the specified time.

Robert H. Derrah of the Boston Elevated Railway company has just completed a map showing all existing and projected street-railway lines in Massachusetts, Rhode Island and Connecticut, as well as the steam roads. There is 2,157 miles of electric roads in the three states, and during the year 1898 some 90,000,000 car-miles were run, carrying over 400,000,000 passengers.

Corporation Counsel Thornton, in the name of the city of Chicago, has sued the Chicago North Shore Street Railway company for \$500 damages because of injury alleged to have been done to the city water mains through electrolysis. The disintegrated main is in Evanston avenue, opposite the street-car company's power house, between Argyle and Winnemac avenues. The claim for damages is based upon the assertion that the return current of the company's trolley line in Evanston avenue affects the main and caused the disintegration of the iron pipe. The street-car officials, it is said, have determined to fight the suit, which was begun in the Circuit Court, to the court of last resort.

The City Council of Moscow, Russia, advises all contractors who are desirous of bidding for the construction of electric railroads in the city to make applications to the City Council not later than the 12th of April. The sum of 750 rubles (\$375) must accompany each application. The council will give all persons presenting applications the terms and conditions of the concessions, with all necessary drawings and statistics as to the working of the tramways in Moscow for the past five years, profits of the different localities, list of lines existing, and approximate prices for making out the estimates. For foreign bidders there will be issued copies of the contracts, printed in foreign languages, which will be sent on demand to all electrical companies. Copies will be sold to all applicants desiring particulars of the contract to be issued. The date of presenting the final tenders will be October 1, 1899.

Two companies, each capitalized for \$300,000, have been incorporated for the purpose of building electric railroads from Aurora and from Elgin to Chicago. They are to be known as the Aurora and Chicago Railway company and the Elgin and Chicago Railway company, and they will compete with the steam railroad companies in the carrying of passengers, mails and express. Elgin and Aurora are each about 40 miles from the center of Chicago, the former northwest and the latter southwest. The incorporators—B. Mahler, H. A. Everett, E. V. Moore, Elmer E. Barrett and Edward Dickinson—are all Cleveland (O.) men, with the exception of the last two, who reside in Chicago, and their experience with long-distance electric lines has been practical. They organized and still operate five lines, running between Cleveland, Lorain, Oberlin, Berea, Akron, Chagrin Falls, Painesville, Elyria and Bedford, O., with a maximum distance of 30 miles between terminal points.

POWER TRANSMISSION.

C. G. Baldwin proposes to use the water of Mill Creek to generate electric power, to be distributed to the farmers in the vicinity of San Jacinto, Cal., to pump water for irrigation purposes.

The aluminum transmission line between Blue Lakes and Stockton, Cal., is nearly finished. Electrical power generated at the former place will be sent over it for the first time about April 1st.

Alonzo Baily is at the head of a company which proposes to utilize the water of the Salt River for the purpose of transmitting power to Globe, Ariz., to furnish light. The electricity will be transmitted 20 miles.

The Washington Power Transmission company has been formed by New York and Boston capitalists. The capital stock is \$1,750,000, and the object to develop hydraulic and electrical power at Cedar River Falls, for use in Tacoma, Seattle and other cities of Puget Sound.

Fred T. Sterling, receiver of the Montana Power company, has filed a petition with the court asking that he be permitted to issue receiver's certificates for the amount of \$77,000, with which to purchase electrical machinery to place the plant in operative condition. Consent was secured.

J. Spaulding, W. H. Carlin, G. L. Hughes and others have appropriated water from the Yuba River at Marysville, Cal., to be used for generating light, heat and power. The intention is to furnish light and power to adjacent towns as far north as Chico and south to Wheatland and Lincoln.

The Clear Lake Electric Power company has asked the right to construct, maintain and operate

a system of electric-light and electric-power lines in Vallejo, Cal., for a period of 50 years. R. Raymond, secretary of the company, says that it is proposed to secure power from Cache Creek and furnish light and power for Calistoga, St. Helena, Napa, Vallejo, Benicia, Santa Rosa and Petaluma.

The Mendocino Electric company has taken the plant, lines, etc., of the Ukiah (Cal.) Electric company, the latter retiring from business. Lines connecting with the old plant will be at once shifted to connect with the new company's plant on Ackerman Creek. The new company will complete the dam. Frank Morse will continue as manager.

Contract for the construction of a Mount Whitney long-distance transmission electric-light and power line, consisting of 62 miles, has been let to G. S. Young and W. A. Burkholder of San Francisco. The company will furnish power and light to Visalia, Exeter, Tulare, Lindsay and Porterville, Cal. The cost of the plant will be over \$200,000, this amount having been supplied by J. H. Hammond of London, W. H. Hammond and A. G. Wishon, local capitalists, and others.

PUBLICATIONS.

A handsome engraving of Washington's mansion-house at Mount Vernon is distributed as a souvenir by the American Electrical Works of Providence. The picture, adorned with vignette portraits of George and Martha Washington, is really a work of art. A printed description of the mansion accompanies it.

The fan-motor catalogue of the Emerson Electric Manufacturing company of St. Louis is out in good season. The fans described are for alternating current and include desk, bracket and ceiling types. They are all guaranteed, and the desk and bracket designs have the improved fan blade of this company, which is of a new shape and is said to do away with all objectionable noise. The catalogue is clear and explicit, well illustrated, and should be a help to buyers.

Henry Raymond Rogers, M. D., of Dunkirk, N. Y., has issued two brochures—one entitled "The Universe; or, the Secrets of the Sun and Stars," and the other "Electricity, the Universal Force." The opening paragraph of the latter essay is the following: "But one force exists, and that universal force is demonstrably electrical. All physical phenomena, every form and manifestation of force without a single exception, may be traced to the mere transmutation of the electrical energy."

A neat booklet, issued "For Your Good and (Incidentally) Our Own," by the Montank Multiphase Cable company of 100 Broadway, New York, explains clearly in an interesting way the new principle of the heat-sensitive cable made by this company. Essentially this principle "consists in the making of all electric wires employed in every interior electric installation, and for whatever service to be rendered, capable of discovering dangerous heat or incipient fire from every infinitesimal point of its length, and giving warning thereof, locally and centrally." The little book is worth reading.

TELEGRAPH.

The Canadian Public Works Department is calling for tenders for the construction of a telegraph line from Spence's Bridge to Nicola, and also one from Kamloops to Nicola Lake.

A correspondent of the *Morning Post* of London points out that the greatest importance of Samoa to England is its connection with the proposed Pacific cable. The islands stand in the direct route of the cable, and it would be no doubt convenient to have one of the all-British stations at Samoa. For this purpose, of course, the absolute possession of one of the islands would be most useful, but even then the cutting of the cable by the enemy in time of war would not be difficult. As various colonial governments have come to a definite decision on the matter, the English technical press urges the English government to agree to the proposed division of cost, and to proceed at once with the design and execution of the work.

After eight years of litigation, including decrees, appeals and cross-bills, there is a prospect that steps will shortly be taken to enforce the decree of the federal court ordering the segregation of the telegraph properties of the Western Union and Union Pacific companies. Judge Munger of Omaha has entered an order striking from the report of Special Master Commissioner W. D. Cornish his recommendation that the parties be relieved from the provisions of the decree and characterizing the recommendation as "impertinent," because Cornish was an officer of the Union Pacific when he made his report. The court further dismisses the supplemental cross-bill of the Western Union Telegraph company, and the case is left as it came back from the United States Supreme Court, with the decree of segregation in full force.

At the South Foreland lighthouse in England trials were made on January 30th, under the supervision of Signor Marconi, of his system of telegraphing without conducting wires between the East Goodwin lightship, 12 miles out at sea, and the lighthouse. The system acted well, the messages being received

and recorded on the tape with absolute accuracy. Signor Marconi had with him two assistants at the lighthouse, Messrs. Kemp and Cohen, and one on the lightship, Mr. Richards, but several of the messages were sent by men on the vessel who had been instructed in the work. The height of the pole used for transmission was 130 feet, and Signor Marconi considered that by this that a message could be sent to the French coast. The receiving wire on the lightship was run 80 feet up the mast. During severe weather the system worked perfectly, and the men on the ship sent messages that were transmitted to Ramsgate. All present were impressed with the demonstration, and promises of support to a resolution urging the Board of Trade and the Admiralty to take up the system were given.

ELECTRICAL SECURITIES.

J. & W. Seligman & Co. offer for subscription at 102½ and accrued interest \$2,845,000 five per cent. consolidated-mortgage gold bonds of the Paterson and Passaic Gas and Electric company, due March 1, 1949. This company is the only one supplying gas or electricity to Paterson and Passaic and the surrounding territory and has a perpetual franchise. The United Gas Improvement company of Philadelphia owns a large majority of the capital stock and will supervise its operations.

Brown Bros. & Co. offer for subscription, at 107½, \$4,000,000 first mortgage and collateral trust 50-year, five per cent. gold bonds of the Philadelphia company, which controls the gas and electrical business of Pittsburgh. The bonds are part of a total authorized issue of \$6,500,000, of which \$1,000,000 is reserved to provide for maturing underlying bonds, and the remainder, \$1,500,000, is to be held under restrictions, for future improvements and extensions. The company has for many years supplied with natural gas the cities of Pittsburgh and Allegheny, Pa., and many adjacent towns. It recently acquired control of the Allegheny County Electric Light company and has contracted for the control of the Consolidated Illuminating Gas company of Pittsburgh. It proposes, by an increased issue of its common stock, to secure the United Traction company of Pittsburg. The bonds are secured by a first mortgage on all the properties of the Philadelphia company and by the deposit of securities in companies controlled or contracted for. By a report of certified public accountants the net income of the companies whose property or securities underlie the bond issue for the year ended December 31st last is shown to have been \$971,571, being \$771,571 in excess of the annual interest charge upon this issue of bonds, or more than 3½ times the amount required to pay the interest.

INDUSTRIAL COMBINATIONS.

Propos of the reported combination of New Jersey electric-lighting companies, the following dispatch from Philadelphia to the *Chicago Tribune*, dated March 5th, is of interest: "The United States [Gas] Improvement company of Philadelphia has assumed control of all the electric-lighting companies in northern New Jersey. The capital stock of the new company is \$20,000,000, and it will be called the Electric Company of New Jersey."

An important consolidation has just been perfected in the vicinity of Buffalo and Niagara Falls, whereby the entire street-railway system of the city of Buffalo, the electric roads of Niagara Falls, with the exception of the Gorge road, and the electric roads connecting Buffalo, Niagara Falls and Lockport have changed hands. The syndicate that has made the purchase has a capital stock of \$25,000,000, and all the interests affected by the change are to be consolidated under one management. The properties affected by the deal are the Buffalo Railway company, the Buffalo Traction company, the Buffalo, Bellevue and Lancaster Railway company, the Buffalo and Niagara Falls Electric Railway company, the Buffalo and Lockport Railway company, the Niagara

Falls and Suspension Bridge Railway company and the Niagara Falls Park and River Railway company. It is understood that the stockholders of the Buffalo Railway company will receive par for their stock; the stockholders of the Buffalo and Niagara Falls road about 75 cents, and the stockholders of the Buffalo and Lockport road about 50 cents. After consolidating all of the properties the new owners will retire all the stock with an issue of new bonds and later float a line of new preferred and common stock.

MISCELLANEOUS.

A dispatch from Redlands, Cal., states that while standing on the iron case of a transformer E. L. Crawford struck his head against a live copper wire carrying 30,000 volts to Los Angeles, making a short-circuit and blowing out the fuses at the power house in Santa Ana canyon. He received no further injury than a slight burn on the scalp and a stunning fall to the ground.

This is what the daily papers report Edison as saying he is doing now: "At present I am working on a device for sending photographs by wire. I am perfecting the machine now, and it will be a success. By this invention an artist can place his sketch in it and by attaching the same to a wire send in the picture to his paper. I am doing the work for Homer Davenport, the artist. This thing has been done before, but the machines have been too cumbersome. I intend to have this one made similar to a kodak."

TRADE NEWS.

John Buckley, Edward F. Davison and F. C. Kummell of Rochester, N. Y., have incorporated the Rochester Electric Motor company, with a capital of \$10,000.

The Standard Electric company of California has been incorporated for the purpose of building electric plants. The principal place of business will be San Francisco. The directors are J. S. Drum, F. H. Dam, M. F. Vendall and others. The capital stock is \$5,000,000.

The Corporation Court of Alexandria, Va., has granted a charter to the National Electrical Supply company, the object of which is to deal in general electrical supplies. The capital stock is placed at \$25,000. H. D. Merrick of Washington, D. C., is president of the company. A. W. Armstrong is named as the Alexandria agent.

The Western Electric company carries the only stock of interior conduit in Chicago. As is well known, the standard rubber-covered wires can be placed in these conduits without violating the Underwriters' rules. Contractors should get prices on conduit and wire from the Western Electric company before purchasing elsewhere.

The electrical supply business which has been conducted by J. A. Erner & Co. at 354 North High street, Columbus, O., will in the future be carried on under the firm name of Erner & Hopkins, Mr. W. A. Hopkins, Jr., having purchased an interest. Mr. Hopkins has been identified with Mr. Erner since the business was commenced. Construction work will be continued under the name of the J. A. Erner Construction company.

W. W. McChesney, Jr., representing Huebel & Manger of Brooklyn, has been in Chicago during the week in the interests of his house. Mr. McChesney is in high spirits, due to the large increase of the business he has secured. He announces that he personally has done more business during the last two months than he did all last year, and the prospects for a still greater increase are exceedingly bright. Mr. McChesney stated that the feeling among business men throughout the country could not be better. Huebel & Manger's products, of course, need no praise, as they have stood the test of time. The suc-

cess of Mr. McChesney, however, is due, in great measure, to his own efforts, as his abilities as a salesman are well known.

The Ward Leonard motor starters, with automatic release, have been lately reduced in price by a reduction varying from 30 to 50 per cent. This great reduction is due, the company says, to new inventions and the cheapening due to large volume of business. The Ward Leonard Electric company makes the claim that it has never yet had a single case of repairs upon its circuit-breakers. This, the company states, is due to the fact that the two independent switches, one upon each pole, make the circuit-breaker self-protecting. This feature in the Ward Leonard circuit-breaker is a strong point in its favor.

BUSINESS.

Eugene Munsell & Co. of New York and Chicago write that they are prepared to separate street-railway companies and electrical manufacturers from their money by giving them in return good India and amber mica for electrical insulation.

McLeod, Ward & Co., 27 Thames street, New York, call attention to the Kinsman desk lamp, for which they claim a large sale. Since its introduction in 1893, the sales of this lamp have steadily increased from year to year. The manufacturers will be pleased to send descriptive pocket catalogue on request.

The Electric Appliance company is inviting its customers and other friends to call and inspect its new building and equipment at 92 and 94 West Van Buren street, Chicago. The new location is easily reached by either the electric or cable surface lines or by elevated trains from any point on the elevated loop. It is only a few minutes' walk from the Monahan building, which is one of Chicago's electrical centers.

The Michigan Pipe company of Bay City, Mich., manufacturers of creosoted-wood conduits for underground wires, cross-arms, poles and railroad ties, has issued a neat pamphlet setting forth the advantages of its products. The company says that it installed a plant for treating timber by the Bethell process, because the experience of engineers in Europe and America has proved that timber treated with deadoil of coal-tar, or creosote, has withstood the effects of time and storm better than timber treated by any other process.

Users of cedar poles may not be aware of the fact that C. H. Worcester & Co., Koss, Mich., control the output of cedar on the line of the Wisconsin and Michigan railway, 55 miles in length, covering a territory of over 400 square miles of cedar forests. This enables the firm to furnish a choice assortment of poles, of which it has a large stock of all sizes on hand for prompt shipment. Worcester & Co. have furnished many of the poles used by some of the largest telephone and telegraph companies throughout the country. They think that it is doubtful whether any other concern is in a better position to fill orders.

The Ward Leonard Electric company of Bronxville, N. Y., not long ago entered the field of manufacturing enameled iron signs. There are, it is said, only five manufacturers of these goods in the United States, and they operate under closely guarded secret processes. The familiarity with enameling processes gained by the Ward Leonard company in the manufacture of its enameled rheostats enabled it to quickly overcome the difficulties attending the manufacture of enameled iron signs, and the company is now enjoying a handsome business in this line and is very much pleased with the prospects of this branch of its business. The Ward Leonard company issues a complete price-list for all sizes and quantities. The telephone and street-railway companies use many of these signs, and they are rapidly growing in favor for numbering and naming dynamos, feeders, circuits, etc.

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued February 28, 1899.

- 620,110. Vehicle Lamp. John W. Eisenhuth, New York, N. Y. Application filed January 5, 1898.
This is a lamp for bicycles or other vehicles carrying an oil burner and an incandescent light, the construction being such that either oil or electricity may be employed.
- 620,111. Cut-out. Edward B. Ellicott, Chicago, Ill. Application filed December 30, 1897.
An electric line terminal consisting of a rounded lug adapted to be secured to an insulating base plate, a terminal portion provided with a receptacle for the connected conductor, and a sleeve rotatably fitting upon the lug and adapted to be secured in position thereon.
- 620,117. Arc Lamp for Electric Lighting. David Gertin, Corning, N. Y. Application filed September 15, 1898.
An inclosed arc lamp having the inner globe closed at the bottom and having a restricted orifice in its peripheral walls for the admission of air below the arc and a passage above the arc for the escape of the gaseous products.
- 620,144. Multiphase-current Transformer. Ernst L. K. F. Kahlenberg, Berlin, Germany. Application filed August 8, 1898.
The combination with a source of multiphase current of a transformer for supplying secondary circuits and having

- multiphase windings and switching apparatus for connecting the windings of the transformer either in star or triangle fashion.
- 620,172. Secondary Battery. Gustave Philippart, Paris, France. Application filed March 22, 1898.
An electrode comprising active material and surrounding washers superimposed and in contact with each other, forming a wall with minute pores or crevices between the washers through which the electrolyte may pass, the washers preventing the escape of the active material.
- 620,196. Electric Time Switch. Hans O. Swoboda, New York, N. Y. Application filed November 2, 1897.
There is a motor device and in combination with it a pair of contact arms and a movable dial adjustably mounted upon the spindle of the motor device and adapted to be driven at a constant speed, a pair of stationary contact pieces located in the path of movement of the arms, an electrically operated switch in the working circuit, comprising a switch blade, an electromagnet, a swinging armature oscillated by the energizing of the magnet and a loose connection between the armature and switch blade, which permits a movement of the armature prior to that of the switch blade in the direction of the common motion.
- 620,197. Coin-controlled Electrical Apparatus. Rob-

- ert W. Taylor, Sr., Chicago, Ill. Application filed February 14, 1898.
A slot machine for giving electric shocks is described. It includes a combination with a coin chute of an electric generator, stationary terminal strips in the chute in open circuit with the generator and positively actuated means for carrying a circuit-closer between the strips in a manner to close the circuit.
- 620,214. Carbon Holder for Electric Arc Lamps. Sigmund Bergmann, New York, N. Y. Application filed January 24, 1898.
This arc-lamp device is provided with a concave seat, a series of balls mounted on the seat and a weight mounted over the balls and tending to force the balls in contact with the seat and guiding tube.
- 620,230. Electric-motor Suspension. George Gibbs, Philadelphia, Pa. Application filed February 28, 1898.
A supporting frame for an electric motor of an electric vehicle consisting of a frame spring-supported at one end from the axle and spring-supported at the other end upon the opposite side of the axle upon the equalizing bars of the truck.

620,254. Four-tub Electric Bath. Carl E. Schnée, Carlsbad, Austria-Hungary. Application filed December 15, 1898.

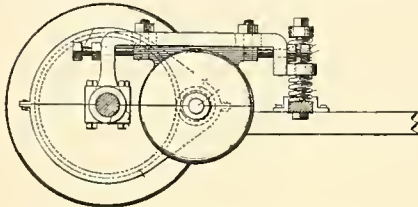
Four absolutely separated tubs of non-conducting material (preferably porcelain) are described. Each tub receives one limb of a person and can be connected in different combinations for every kind of treatment of the body, combined with an adjustable bathing chair.

620,256. Means for Suspending Electric Motors. Sidney H. Short, Cleveland, Ohio. Application filed June 15, 1898.

A frame is journaled at one end upon the driven axle and spring-supported at the other end from an independent support, and a motor is attached thereto provided with means for adjusting the motor toward or from the driven axle.

620,257. Means for Suspending Motors. Sidney H. Short, Cleveland, Ohio. Application filed June 22, 1898.

A supporting frame is, at one end, journaled to the driven axle and at the other spring-supported from an independent support. A motor has trunnions journaled in the frame and springs limiting the movement of the motor relatively to the supporting frame.



NO. 620,256.

620,283. Regulating Transformer. Edward W. Cowan and Alfred Still, Bowdon, England. Application filed December 29, 1897.

A regulating transformer comprising a fixed portion forming part of an iron circuit and a movable portion forming the remaining part of the circuit; the secondary winding is carried partly by the fixed and partly by the movable part, the parts being so arranged that in one position of the movable part the two parts of the secondary winding shall act against each other, and in another position they shall act with each other.

620,302. Automatic Cut-out for Electrical Transformers. William J. Greene, Cedar Rapids, Iowa. Application filed October 11, 1897.

The first claim describes the combination with a suitable retaining case of an oscillating controller pivoted to a suitable standard, a low-resistance solenoid adapted to move the controller to close a switch, a switch closed thereby and connections thereof with secondary mains and a transformer in permanent connection therewith, a high-resistance solenoid in a shunt circuit through the controller, an intermittent transformer and a switch co-acting with the high-resistance solenoid to cut it in, the switch consisting essentially of cups containing mercury or the like conductor, double-pole contacts adapted to dip therein, a guide adapted to cause the contacts to move in a vertical plane, an oscillating gravity arm adapted to open the switch, a supporting standard therefor and for the controller and links connecting the gravity arm with the mercury-contact switches.

620,305. Leuring Iron. William S. Hadaway, Jr., New York, N. Y. Application filed January 26, 1898.

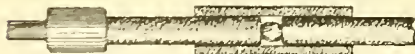
A hot press bag comprising a metallic body containing an electric resistance to heat the same, and provided with suitable electrical connections, a flexible covering attached to the margin of such metallic body, and a yielding filling of heat-conducting particles between such covering and body.

620,306. Electrically Heated Tool. William S. Hadaway, Jr., New York, N. Y. Application filed January 26, 1898.

The tool has a heater body and an electrode adjustable to and from the same to form an arc. A sleeve of refractory insulating material surrounds the electrode adjacent to the arc, such sleeve serving to insulate the electrode and support it movably adjacent to the heater body.

620,307. Process of Forming Magnesia Insulation upon Conductors. William S. Hadaway, Jr., New York, N. Y. Application filed January 26, 1898.

The process of coating electric wire with an insulation of magnesia for use in electric heaters, which consists in first coating the wire with metallic magnesium, and then applying an oxygen-bearing substance, as manganese oxide, to the coating of magnesium, and heating the whole to decompose the manganese oxide and oxidize the magnesium upon the wire.



NO. 620,306.

620,308. Incandescent Arc Light. William S. Hadaway, Jr., New York, N. Y. Application filed February 16, 1898.

Where the carbons of an arc lamp are of uniform cross-section a refractory sleeve is fitted close to them, about the arc and adapted when the light is in operation to be heated to incandescence in proximity to the arc. The sleeve may be made of fused magnesia.

620,309. Electric Fuse. William S. Hadaway, Jr., New York, N. Y. Application filed April 27, 1898.

A magnet wire or strip is employed to conduct and to break the current, and adapted to oxidize below the point of fusion, thus forming an infusible conductor under such conditions.

620,326. Electric Recording Apparatus. Charles L. Jaeger, New York, N. Y. Application filed April 19, 1898.

The combination of a series of contacts and a conductor arranged in series relatively to each other but not placed in direct contact, a recording device comprising a second series of contacts corresponding to the first series of con-

tacts and electrically connected with them, a conductor arranged adjacent to the second series of contacts, but not in actual contact with them, a spark-producing device, electrical connections between the device and the conductors and contacts, and means for feeding a record paper between the second series of contacts and the corresponding conductors—so constructed and arranged to form perforations in the record paper.

620,327. Electric Recording System. Charles L. Jaeger, Maywood, N. J. Application filed August 11, 1898.

In an electric recording apparatus the combination of a movable body made of non-conducting material and provided with an opening or slot permitting the passage of sparks, means for moving a strip or chart, means for producing sparks, and electrical connections.

620,333. Direct-current Motor and Method of Operating Same. Benjamin G. Lamme, Pittsburg, Pa. Application filed December 16, 1897.

A direct-current motor is provided with a commutator and with collecting rings and brushes, in combination with an external circuit having the brushes for its terminals and containing a transformer winding or windings; means for connecting one of the supply mains with one of the commutator brushes are provided and also means for connecting the other main with the other commutator brush or with a point in the external circuit at will, in order to operate the motor at different speeds.

620,334. Direct-current System of Electrical Distribution. Benjamin G. Lamme, Pittsburg, Pa. Application filed August 4, 1898.

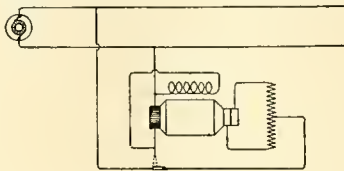
The combination with a compound-wound direct-current generator of one or more pairs of feeding conductors connected in the usual manner to the generator, a shunt to the series winding of the generator and one or more pairs of feeding conductors connected to the armature terminal that is opposite the series-winding connection and to the shunt at a point intermediate its terminals.

620,335. Method of and Means for Varying Speed of Direct-current Motors. Benjamin G. Lamme, Pittsburg, Pa. Application filed September 3, 1898.

The method of operating direct-current electric motors at different rates of speed which consists in varying the phase relation between current and electromotive force in the armature circuit, whereby the armature reaction is varied.

620,336. System of Electrical Distribution and Regulation. Benjamin G. Lamme, Pittsburg, Pa. Application filed September 28, 1898.

A system of electrical distribution comprising a source of direct currents, a rotary transformer receiving current from that source and supplying alternating currents to translating devices and one or more chokes in series connected across the alternating-current circuit or circuits, these coils being so proportioned as to compensate for changes in inductive load in the work circuit, whereby the speed of the rotary transformer is kept approximately constant.



NO. 620,333.

620,343. Rotary-transformer Regulation. Ralph D. Mershon, New York, N. Y. Application filed October 31, 1896.

A system of electrical distribution comprising an alternating-current circuit containing inductive resistance and a rotary transformer provided with adjusting means variable at will, whereby the field charge may be varied in accordance with the voltage desired at the direct-current terminals.

620,365. Means for and Method of Electromotive-force Regulation. Norman Rowe, Wilkesburg, Pa. Application filed January 27, 1898.

The method of raising or lowering the electromotive force supplied by a transformer having a winding the active length of which is variable which consists in first inductively adjusting the electromotive force corresponding to one length of winding to that corresponding to a different length and then changing the circuit connections to correspond to the adjusted electromotive force.

620,404. Electric Railway. Louis M. Aspinwall, Pittsburg, Pa. Application filed February 25, 1898.

Features enumerated are a feeder, a single line of roadway contacts normally insulated from the feeder and from each other, and a series of electro-magnetically actuated circuit-making and breaking switches, each of which embodies a coil having a low-resistance connection at its respective ends with one of the roadway contacts and with one of the switch contacts and having a permanent high-resistance connection to ground.

620,440. Telephone Switch. William D. Gharky, Philadelphia, Pa. Application filed June 16, 1898.

Line wires extend to a subscriber's station; a subscriber's talking circuit is adapted to be connected thereto, and there is a switch for completing the connection, a signal included in the completed circuit and remaining unaffected as long as the circuit remains intact, a local circuit containing a subscriber's transmitter, a battery and the primary of an induction coil, means on the switch for closing the local circuit, a normally closed auxiliary switch in the circuit and means whereby the latter is automatically opened when use of the instrument is suspended.

620,466. Process of Utilizing Spent Battery Solutions. Joseph Lones, Smethwick, England. Application filed November 22, 1897.

This is a process for the recovery of residual products from the spent solution of voltaic batteries in which the positive metal is zinc and the exciting liquid is a solution of a caustic alkali. It consists in treating the spent solution with a sulphide to precipitate the zinc contained therein in the form of sulphide of zinc, separating the precipitate from the liquid and subsequently treating the filtrate with an oxidizing agent so as to convert any thiosulphate of the alkali into sulphate of the alkali, further treating the solution with steam of lime and afterward with barry's water so as to remove the sulphate contained therein, and finally separating the clear liquid from any

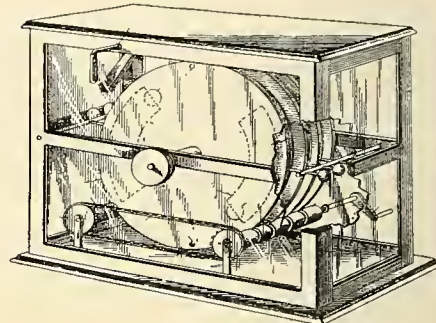
suspended matter and evaporating the clear liquid until it has acquired a strength sufficient to fit it for reuse as the exciting liquid of a voltaic battery.

620,473. Electrical Machine. George F. Martin, Corydon, Ind. Application filed July 18, 1898.

One claim describes a machine having stationary armature plates and movable motor plates, with supports for the armature plates, whereby the same may be adjusted, consisting of a pair of interengaged shafts, means for rotating the same in unison, and a sleeve of insulating material upon each of the shafts provided with grooves within which the edges of the armature plates fit, and a grooved insulating guide piece for the upper edges of the armature plates.

620,479. Sheet-metal Trolley Wheel. George E. Mittinger, Jr., Cleveland, Ohio. Original application filed August 30, 1898. Divided and this application filed December 6, 1898.

A grooved pulley composed of a pair of sheet-metal disks provided with flanges bent upwardly and outwardly in opposite directions, the flange of one of the disks being extended so as to form the outer grooved face of the pulley and embrace and interlock with the flange of the other disk.



NO. 620,473.

620,491. Telephone Switchboard. James M. Over-shiner, Elwood, Ind. Application filed January 24, 1898.

The combination with a jack and a drop of a plug to enter the jack and an engaging device on the plug adapted to co-operate with the drop to restore it as the plug is inserted into the jack and also while it is being withdrawn therefrom.

620,513. Combined Lighting and Alarm Device. John Thorsen, North Aurora, Ill. Application filed June 30, 1898.

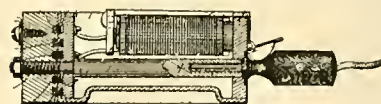
The claim describes the combination with a movable floor section or trap of an angle lever, a wire or the like connected to one arm of the lever and to the floor section or trap, suitable guides for the wire, an adjustable support for the wire, an alarm mechanism having a turning post, a slotted device adapted to engage the post and normally prevent its turning, a connection between the device and the angle lever whereby the device is disengaged from the post when the lever is operated, an electric lamp having a lever connected to its switch key, and a connection between the lever and the angle lever.

620,514. Potential Regulator for Dynamos. Allen A. Tirrill, Whitefield, N. H. Application filed April 28, 1898.

The main supply wires of the dynamo are connected to a normally closed primary branch circuit and provided with one or more operating helices; a pair of contact terminals are arranged to be opened or closed upon each other by the action of the helices; a supplementary branch circuit is connected also to the supply wires and terminating in the pair of contacts mentioned; a relay is arranged in this supplementary circuit, a shunt circuit connecting with the dynamo and provided with a rheostat, the shunt circuit having two terminals extended to the armature of the relay and being opened or closed by it.

620,537. Coin-controlled Mechanism for Electric Meters. William F. Browne, New York, N. Y. Application filed December 28, 1897.

In a coin-controlled mechanism the yieldingly supported frame for the coin wheel, having a contact point, another contact point adjacent thereto, means for moving the frame to bring the points in contact, a movable contact section or switch in the main circuit, an electromagnet adjacent thereto, adapted to operate it, and electrical connections between the main circuit, the contact points and the magnet.



NO. 620,491.

620,547. Signal System. Edward L. Hail and George Hail, Providence, R. I. Application filed August 17, 1897.

One claim reads: A signal system for indicating the movements of an elevator car comprising an alarm, an electric circuit including said alarm, means rendered inoperative by the stoppage of the car at any point in the hatchway for closing the circuit to sound the alarm when the car is approaching a predetermined point and for breaking the circuit when the car has reached or passed said point.

620,549. Electric Railway. James F. Munsie, New York, N. Y. Application filed February 25, 1898.

A supply system for electric railways comprising a series of water-tight contact boxes mounted along the track and provided with an elastically yielding vertical plunger extending into the box through a water-tight joint, a circuit closer within each box adapted to co-operate with an insulated conductor traversing the system and extending from box to box, the plunger being provided with means for preventing it from turning on its axis and with a roller at its top projecting into a grooved guide rail for a collector carried by the car

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No. 11

Transformer Station at Tonawanda, N. Y.

By ORRIN E. DUNLAP.

One of the fine new buildings that the Niagara power development and transmission have given to the Western New York section is the transformer station of the Tonawanda Cataract Power company on Robinson street, North Tonawanda, N. Y. This structure is of brick. Its dimensions at the foundations are about 80 by 60 feet, and it is a story and a half high. It is located very close to the Buffalo-Niagara power transmission line, from which it receives its supply of current. In every feature the construction of the building is most substantial; in fact, it is very characteristic of all that is done by the men connected with the generation and distribution of the Niagara

Buffalo and Niagara Falls road, which are used to Buffalo. The Buffalo and Lockport road is also supplied through a sub-station at the Lockport terminal of the trunk line, while the Buffalo and Niagara Falls road is supplied also at the Niagara Falls end from rotaries located in the central station of the Niagara Falls Power company. Thus both of these great electric-road trunk lines are now operated by Niagara power.

The lightning arresters and high-tension board are to be located on the second floor. The switch-board on the lower floor, Fig. 3, is of white marble and has eight panels fully equipped for controlling the various currents. A lighting plant is to be installed in the west half of the building.

In addition to the electric-road service, it is intended that this plant shall supply Niagara power

Steel Girders Burned by an Electric Arc.

An interesting useful application of electric-arc burning recently took place in Chicago in connection with reconstruction work in the New York Life building. The contractor for the building, the Moulton Starrett company of Chicago, was engaged in remodeling a portion of the building to suit a new tenant. To provide for two new stairways from the main floor of the building to the basement it was found that it would be necessary to cut through two sets of three steel I-beams. These six I-beams were each 15 inches high with a half-inch web and six-inch flange varying in thickness from a quarter-inch on the outside to one inch at the center. It will be appreciated that the section of metal to be cut through was considerable. The point at which the cut was to be

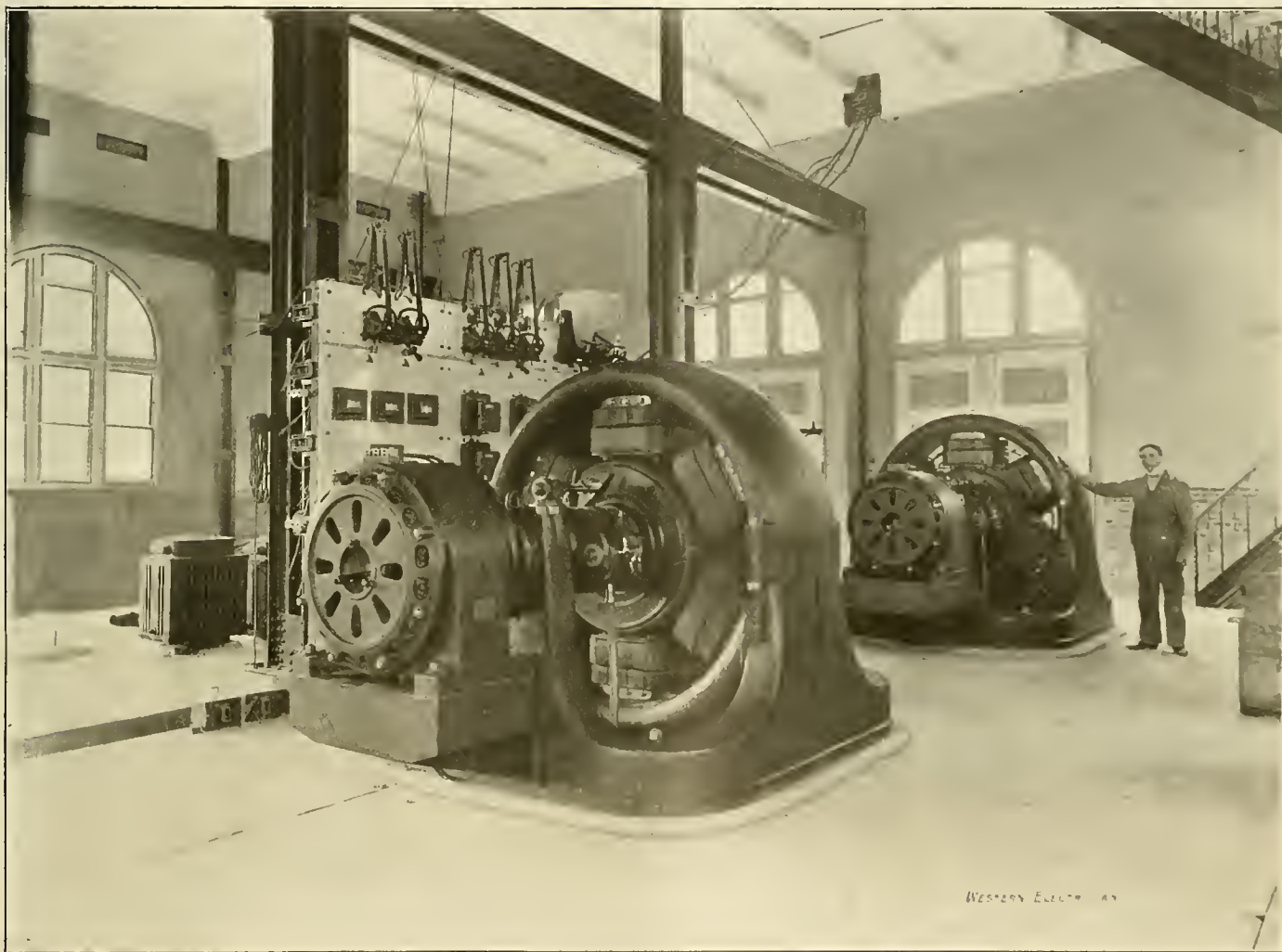


FIG. 1. TRANSFORMER STATION AT TONAWANDA, N. Y.—ROTARIES.

current. The lower floor has been left in a single room, and is provided with two 12-ton cranes. Granolithic pavement is laid throughout. The east side of the room is devoted to the present installation (shown in the picture on this page), and there have been placed two 500 horse power rotary converters and four static transformers, each oil-cooled and of 500 horse power. Room has also been provided for two additional rotaries. The current from the transmission line enters the building on the east side at a voltage of 11,000, three-phase, alternating. After passing through the high-tension circuit-breakers on the second floor it goes to the static transformers, one of which is shown in Fig. 2, where it is reduced to 375 volts, and is then fed to the rotaries, which convert it for the electric-railway system and commercial purposes. Current from this station is furnished to the Buffalo and Niagara Falls electric road for its operation from the car barns to the Buffalo line, and to the Buffalo and Lockport road from a point near Pendleton Center to the tracks of the

for industrial purposes through the locality where it is built. The Tonawanda Cataract Power company was organized for the purpose of distributing Niagara power in the town of Wheatfield and city of North Tonawanda, Niagara County, and the town of Tonawanda and village of Tonawanda, Erie County. Its officers are: President, Charles A. Sweet of Buffalo; secretary and treasurer, William B. Rankine of New York, and assistant secretary and treasurer, De Lancey Rankine of Niagara Falls, N. F. Irish is the superintendent in charge of the station.

Both Tonawanda and North Tonawanda are great lumber markets, and within their borders quite a little power is used. Both places have for some little time longed to be placed in touch with the Niagara power development, and the construction of this station gratifies their ambitions in this direction. The shipping facilities of the Tonawandas by rail and water are excellent, and the distribution of the Niagara energy may lead industries to locate there, many fine sites being available.

made was located in such a position that it would be necessary to have special saws made, and as three I beams of this size, side by side, would not cut very easily, it was estimated that in addition to the time required to make the special saws it would take two men at least two weeks at \$3.50 a day to saw them off. This loss of time in finishing the job and the expense involved were important considerations, and when it was suggested to Mr. Ralph Starrett, superintendent of the contracting company, that inasmuch as a smooth cut was not necessary, it might be feasible to get the girders burned off with the electric arc, he placed the matter in the hands of Clyde J. Coleman of the Coleman Laboratory of Experimental Engineering. Mr. Coleman has done considerable work in the line of electric-arc burning for the purpose of getting into safes and vaults with broken locks, and for cutting new doorways in vaults already in place, and also as an interesting experiment to demonstrate the possibilities of safe burglary by this method. Mr. Coleman pronounced the plan

of burning off the I-beams perfectly feasible, and undertook the task. The time actually required for electrically burning off the six girders was about 12 hours, and from four to five hours more was spent on mechanical work, such as removing girders to get at the remainder. The electric arc therefore did in two working days what would have required from two to three weeks by the usual method, resulting in a great gain of time for completing remainder of the job. The work was carried out by Clyde J. Coleman, Clarence W. Coleman and J. R. Cravath of the Coleman Laboratory of Experimental Engineering.

The plan of operation is very simple. Current was applied at 110 volts from one of the dynamos in the plant of the building. The current used was about 350 amperes. The positive side of the circuit was grounded on the structure of the building and the negative connected to a carbon holder containing a 1½-inch round carbon. The carbon holder had a wooden handle. The operator struck an arc between the spot on the iron to be melted and the carbon. The light and heat were intense, and the

Practical Applications of the Rotary Equalizer.

By CHARLES B. DAVEY.

The rotary equalizer is an appliance by means of which the potential between the two sides of a three-wire system is maintained at a balance.

In plants where current is generated at 220 volts and the load is divided between light and power, it would, in the writer's opinion, be good engineering to install an equalizer and distribute current for the lighting at 110 volts. The increased efficiency of the 110-volt over the 220-volt lamps and the speed control of the motors affected by the two-voltage method and commutated fields would make this one of the most efficient methods, involving the least amount of machinery. The losses of transmission or line loss would be more than offset by the increased all-round efficiency.

Another application of the equalizer, where it can be used to great advantage, is in isolated plants, where two sets of mains are brought in from a central station, the current being used in cases of

as will be described later, which would bring the losses to a minimum, they might almost be neglected. The better regulation at point of distribution, giving a higher life efficiency of the lamps, should further help to balance this loss. Where three-wire-system mains are brought in from a central station there is certain to be a difference of pressure between the two sides of the system, and further, the losses need not amount to very much even at full load; it would depend to an extent on the wiring. If the keeping of the system in balance had been properly worked out the lack of balance at any time should be very little; consequently, the capacity of the equalizer could be reduced, and with it, of course, the losses would be reduced. A fair estimate of capacity for an equalizer would be 10 per cent. of the plant capacity.

From the central-station point of view, what is the objection to the use of the equalizer across the power mains, in the case of the central station supplying current for lighting at one cent a lamp-hour? The central-station company certainly does replace the burnt-out lamps, provided they are returned intact; but this is a very small item, for, assuming that a lamp has an average life of 600 hours, which is a conservative estimate, at one cent a lamp-hour this would mean that for every \$6 paid for current one new lamp has to be supplied, which, estimating the price of the lamp at 20 cents, would be equal to but 3-3 per cent. of the cost of current. Then why such a difference between light and power rates? It may be argued that the power rates are low to insure a day load and so raise the plant efficiency of the station; but then power can be obtained at any time in the 24 hours at this price. Of course, it is a recognized fact that more current is consumed as power during the day, but there are plants consuming as much current at night as during the day, and

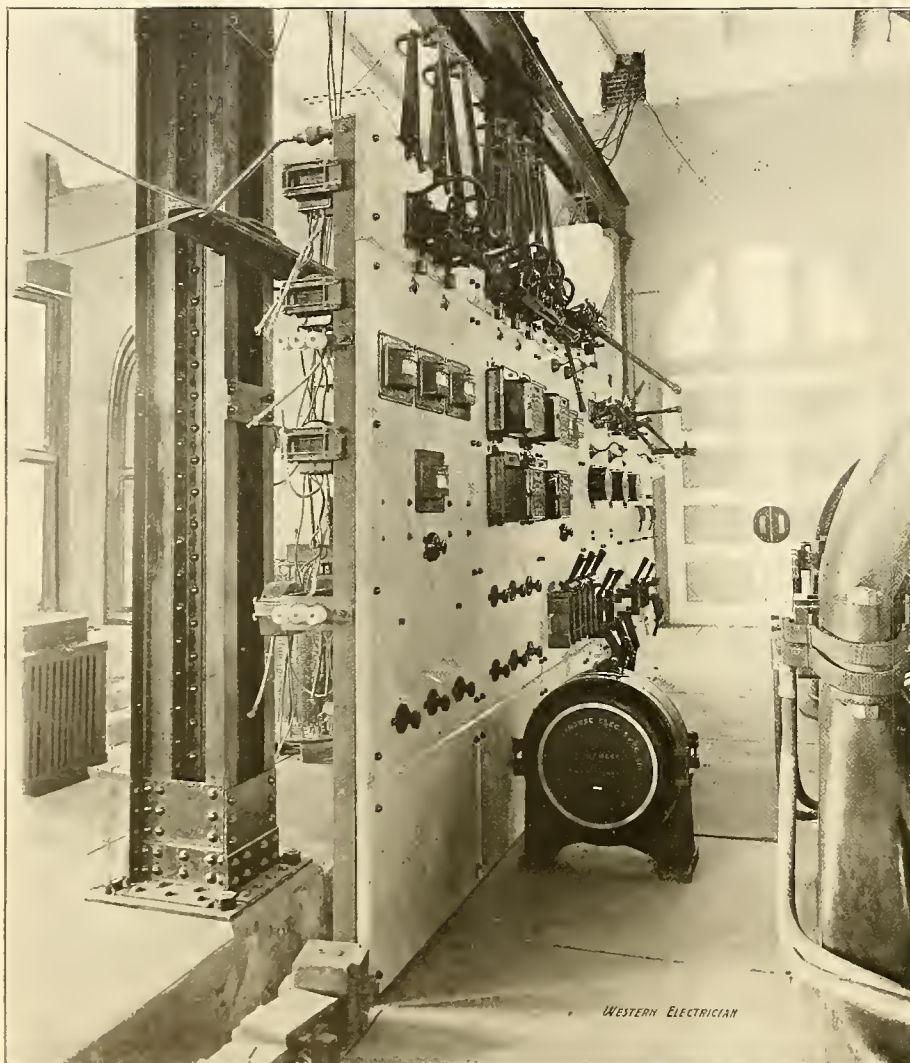


FIG. 3. TRANSFORMER STATION AT TONAWANDA, N. Y.—SWITCHBOARD.

effect was very disastrous to the eyes where proper precautions had not been taken. The arc is usually covered over with a muffle, consisting of an asbestos-lined iron box, with a hole in the back just large enough to admit the carbon used. The box is placed against the iron to be burned and the carbon thrust through the hole and the arc drawn. In places where there is not room for the box the carbon is simply thrust through a shield consisting of a sheet of heavy asbestos board. Some resistance has to be placed in the circuit, as is the case with any arc working on a constant-potential circuit. The resistance used in this case was simply a few turns of german-silver wire placed in a pail of water under a faucet, from which it was constantly replenished.

Municipal Ownership for St. Augustine.

An ordinance has passed its first reading in the City Council of St. Augustine, Fla., providing for the municipal ownership of an electric-lighting plant. There need not be no doubt that the ordinance will become a law, and that the question will be submitted to a vote of the people at the next municipal election to be held in June. There are three private lighting plants in the city, connected with the Ponce de Leon and Alcazar hotels and the railway station and office.

breakdowns, or at such times as the local plant may be shut down for overhauling. The equalizer could be placed across the power mains and current distributed at the lower voltage for lighting. The chief advantage derived from such a scheme is in obtaining the current for lighting at considerably reduced rates, such current being charged at one cent a 16 candle power lamp-hour and current for power at 10 cents a kilowatt-hour; but the difference in price is not so great in these figures as it is in the rates of discount.

To give an example where light and power are used, we will take the cost of 1,085,184 watt-hours at light rates. This would equal 16,956 16 candle power lamp-hours, and, assuming that a 16 candle power lamp consumes 64 watts of energy, which is a fair estimate of the average lamp used in an isolated plant, this, at one cent a lamp-hour, would amount to \$169.56, less 10 per cent. discount, which would make the net cost \$152.60. Now, taking the same amount of energy, but at power rates, it would be 1,085 kilowatt-hours, and at 10 cents a kilowatt-hour would equal \$108.50, less 42 per cent., or net \$62.93, thus showing a saving of the difference between \$152.60 and \$62.93, or \$89.67.

This saving would have been further augmented if power had been used also, for it would have increased the discount when the consumption of energy exceeds 2,000,000 watt-hours a month, this discount being 55 per cent. Of course the equalizer losses have to be deducted, but with such a machine

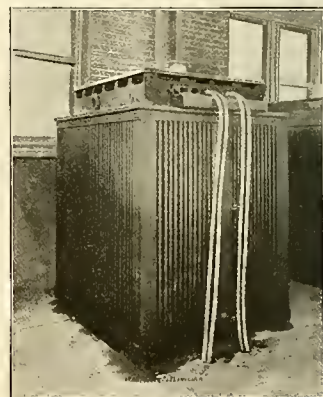


FIG. 2. TRANSFORMER STATION AT TONAWANDA, N. Y.—ONE OF THE STATIC TRANSFORMERS.

consequently they should have a different rate. In some cities a system of two-rate metering is adopted, whereby during certain hours of the day you can obtain current at very much reduced rates, and at night, when the danger of overloading the station is at stake, the rate is increased.

And, further, in an isolated plant where two generators are run in series on the three-wire system, and there is insufficient capacity, the lack of capacity being but a peak of short-time length, not sufficient to warrant the installation of another generator, good practice would indicate the running of the power mains in parallel with the outsides of the three-wire system. Could the central station object to this? Now this is practically the same as using an equalizer, for the current would be supplied to the lighting system.

The writer had occasion some time ago to estimate the cost of furnishing lighting to the extent of 160 amperes direct from the central-station light mains, and of supplying the same amount of current by running the central-station power mains in parallel with the outsides of a local plant's three-wire system, and he found that the cost of using the light mains was divided by three by using the power mains. Where an isolated plant is installed and the central-station mains are used for Sunday lighting or such other times of light load as will not warrant the running of the plant, it would be better to use a motor-generator, or a three-wire generator could be designed for such a purpose, though it would be hardly practical, perhaps. It would have to be a 220-volt generator with a third brush placed midway of the other two. Such a machine would undoubtedly spark badly with any great difference in load, but it is likely that this would be considered better than paying the lighting rates. By such a method the losses would increase as the load, whereas, with an equalizer, the losses simply increase as the difference in load.

While the means of obtaining this balance are possibly numerous, a few of these methods will be mentioned and may be of interest.

In Fig. 1 *A* and *B* are two 110-volt compound-wound machines and *C* is a 220-volt generator. Where the motors are of different capacities and different speeds they are belted together, that their counter-electromotive forces, when running empty, may be alike. In operation the action of such an equalizer is as follows:

Should more lamps or load be placed on *A*'s cir-

cut, the potential difference of that circuit will fall, while the potential of *B*'s circuit will rise the necessary amount to take up the 220 volts existing between the outside wires. *A*'s counter-electromotive force now becomes its electromotive force and supplies current to its circuit, and *B* will run as motor with an increased speed, the amount of increase of speed, of course, depending upon the conditions or extent of unbalancing. As both machines are compound-wound, with the winding so proportioned that they will compensate for any *C*R losses in the armatures, any deviation from what may be termed the critical speed will be very slight. It must be remembered that the series turns act in reverse directions in motor and generator, as the

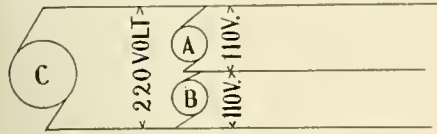


Fig. 1.

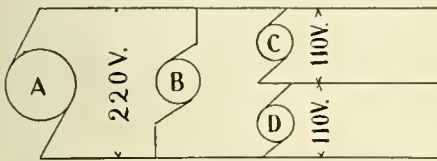


Fig. 2.

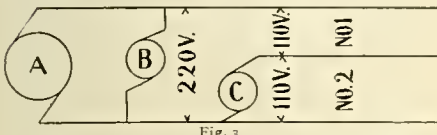


Fig. 3.

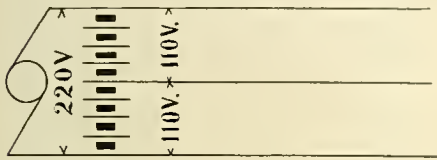


Fig. 4.

PRACTICAL APPLICATIONS OF THE ROTARY EQUALIZER.

difference in load or balance becomes greater, so that the necessity for the series turns will be more apparent, and the finer the adjustment the finer the balance that can be maintained.

Should a reverse condition of balance take place, so that *B*'s circuit is the heavier loaded, *B* will become a generator and *A* a motor; in fact, a reverse order of things will take place.

In Fig. 2 *A* is a 220-volt generator, *B* a 220-volt motor, *C* and *D* two 110-volt machines. In operation this plan is similar to that indicated in Fig. 1, with the only difference that it can take care of a larger lack of balance. The 220-volt motor *B* is a small machine with a pulley at each end of the armature shaft and belted to both machines *C* and *D*, and it makes up for the losses of these machines (*C* and *D*) and allows them to be run at their full capacity; that is, they will deliver, if necessary, their full output to the line.

In Fig. 3 *B* is a 220-volt motor, *C* is a 110-volt machine, while *A* represents the 220-volt generator. The action of the device is the same as in the previous ones given. When No. 1 circuit is heavily loaded *C* will run as a motor and current will be generated by *B* and so raise the potential. The objection to this plan is that it will not regulate as closely, neither will it take care of so great a difference in load, the unbalancing being only equal to the capacity of the 110-volt machine.

Another system for equalizing might be mentioned. It is by use of the storage battery (Fig. 4). But it can hardly be as efficient as using the machines, due to the lower efficiency of transformation; neither is it as practical, for with the machines as energy is absorbed on one side it is given off on the other. This is not the case with the battery. Further, with the storage battery the initial cost would be considerably greater, and necessarily the cost of upkeep would be greater, for it should be installed of such capacity as would take care of the entire system in case of failure of the generating plant. Its greatest field, however, is possibly that of an auxiliary in times of heavy calls of short duration, and the fact that it would tend to increase the plant efficiency by allowing of the generators to be shut down during hours of light load must also be taken into consideration.

But probably the best arrangement for an equalizer is that of having one single machine with two windings on its armature and two commutators. This would undoubtedly give the best results with a minimum of trouble, the losses also being the lowest possible—one friction loss, one hysteresis and eddy current loss, one field loss, one set of journals, no armature reaction (consequently no sparking at the brushes with change of load), no change of speed if the armature resistance is of such a value that the *C*R drop through it would equal the raise in voltage on the other side.

In using separate machines armature reaction should be taken into account, and since the reaction

in motor and generator are in opposite directions the brushes should be set at a compromise between the two tendencies.

Practical Hints for the Electrical Mechanic.

A contributor of the WESTERN ELECTRICIAN made a galvanometer recently on the following lines: The base-piece *A*, Fig. 1, is wood. The lamp *B* is a common oil lamp. The screen *C* is a piece of tin tacked to the top of the upright board *D*. The lens *E* is a common magnifying-glass, such as is sold by dealers in optical goods, and is mounted in a wooden frame. Fig. 2 shows a good way to mount the glass. The vertical piece of wood is provided with a bore the diameter of the glass, and the glass is set in this. The lens-holder is mortised into the platform piece, and four screws which pass through the latter are used for leveling the glass on the base. The coil and needle plan is at *F*, in Fig. 1. The platform is wood and is fitted with leveling screws. Fig. 3 shows the plan of the needle suspension. The needle *A* is common steel with temper drum. A piece of mirror *B* is glued on at *B*. The core *C* can be made of cardboard. An ordinary lamp chimney will do to set over the coils, but it should be fitted with a cap like that shown in section in Fig. 4. This cap or top-piece is wood provided with a five-eighths-inch hole in the middle and fitted with a thumb-screw, as shown. A piece of this wood is glued over the opening in the cap and a small hole is put through the center of this for the suspension fiber of the needle system. Coming now to the coils, these can be wound on the form in Fig. 5. After winding the coils, shellac and dry them. Two are required, one for each side of the needle system. No. 32 to 36 wire is used. We now have the instrument ready to set up. Carry the top end of the fiber to the cap of the chimney, connect with the thumb-head, wind and adjust the system until the bottom needle is suspended in the center of the coil and the top needle is about one-half inch above the upper coil. The instrument may now be adjusted and used on practically the same principle as the regulation kind.

SETTING BRUSHES.

The diagram of Fig. 6 is given to show an instance in which the brushes are not set diametrically opposite, for this is a multipolar motor with cross-connected armature. In four-pole machines of this type the brushes are set at 90 degrees, with two sets of brushes, and for the six-pole machines at 180 degrees. Therefore, to set the brushes on one of these machines, first determine the correct position by means of a blue-print draft, and maintain this position. A common trouble is due to setting the brushes too far apart on these machines, resulting in the blowing of the safety fuse.

USE OF THE MICROSCOPE.

It is well known among electrical engineers and mechanics that much time and trouble is saved if the proper outfit is used. For ordinary microscopic work in the electrical business, the following apparatus may be used, representing only the most essential pieces: Microscope, complete with two eye-pieces, a two-inch and a one-inch, and two objectives, a one-inch and one-fourth-inch. This will give the following approximate enlargements in diameters:

Eye-pieces.	Objectives.	
	One inch.	One-quarter inch.
Two inches	50 Diameters.	200 Diameters.
One inch.....	100 Diameters.	400 Diameters.

A few three-by-one-inch glass slides and oblong cover glasses are also to be included, together with a half-dozen bottles to hold the test solutions that are required; also a few fine needles held in soft pieces of wood (handles), to be used in handling wires and small work while under examination. The most important point to be observed in commencing microscopic work is to select a window facing the north if possible, and in a room where there is the least amount of dust. It is best to keep the microscope when not in use locked in a case, and it and all the utensils for the work placed in a closet. This will insure them being always clean and ready for use.

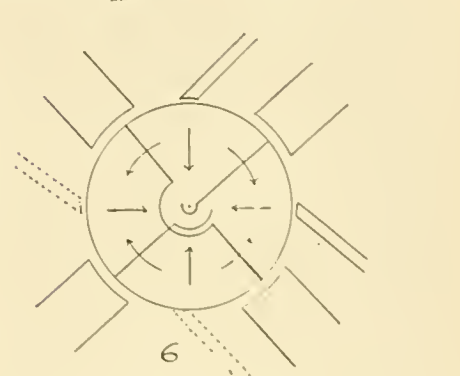
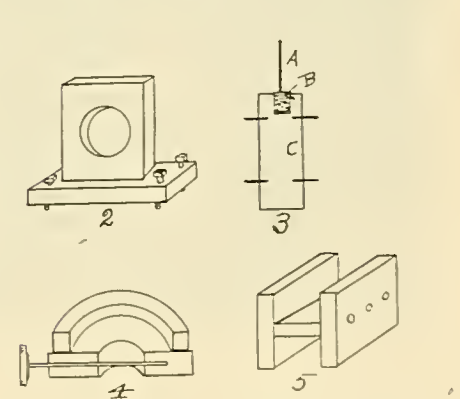
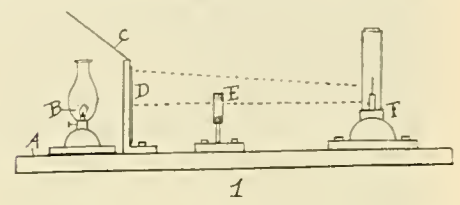
Submarine Telegraphs of the World.

Recent government statistics show that the submarine telegraphs of the world number 1,500. Their aggregate length is 170,000 miles; their total cost is estimated at \$250,000,000, and the number of messages annually transmitted over them 6,000,000. All the grand divisions of the earth are now connected by their wires. Adding to the submarine lines the land-telegraph systems by which they are connected and through which they bring interior points of the various continents into instantaneous communication, the total length of telegraph lines of the world is \$35,000 miles, the length of their single wires, or conductors, 3,500,000 miles, and the total number of messages annually sent over them 305,000,000, or an average of 1,000,000 each day. Of the 170,000 miles of submarine telegraphs, about 150,000 belong to 35 companies operating the commercial cables, which number about 320; the remainder are mostly short lines controlled by governments, and connecting forts, batteries, signal stations, lighthouses, etc., the aggregate of government lines being about 1,150 and their total length about 20,000 miles. In addition to this, the governments of the world hold about 80,000 miles of cable in stock for war purposes, ready to be laid at a moment's notice.

Patent Systems of the United States and Foreign Countries Compared.

By W. C. JOSE.

The possession of a patent system is the highest test of the civilization of a people. The last species of property to be recognized is the product of the intellect, that intangible subject-matter the right of ownership in which cannot be physically asserted, but must rest in the recognition and good-will of the populace. Before the dawn of civilization, the last act of semi-barbarism in the progress of a nation toward the light is the granting of patent for inventions by royal gift or legislative enactment for a money consideration, and the first act in the early morning of civilization is the establishment of a uniform patent system accessible to all, whereby the patent is granted for a limited term in consideration of the eventual gift of the invention to the public. Tried by this test, China stands just below the line of civilization and Japan has within a few years risen above it. In China patents for inventions can be procured only by royal grant and for a considerable influence and money outlay, while Japan, closely following the successful termination of the war which marked her break from the semi-barbarian past, has joined the modern nations by the adoption of a patent system. It is interesting to note in the case of Japan how the nation had made a considerable advance in the adoption of the materials of civilization before it awoke to the grander idea of the right of property in the product of the mind. Travelers in Japan, a few years ago, tell us that the disregard or lack of conception of this idea of right of ownership had proceeded to such a stage as to lead the Japanese artificers not only to copy the manufactures of foreigners, but to copy and adopt their name plates and personal marks of identification as well. But Japan has now taken the final step that carries her full into the sisterhood of enlightened



PRACTICAL HINTS FOR THE ELECTRICAL MECHANIC

nations by her formal recognition of the right of ownership in the produce of the mind. The evolution of the patent system among nations has been toward the growth of the patent privilege and the removal of restrictions in its grant and enjoyment, and the principal nations of the world have advanced far in this direction, while the United States stands pre-eminently first and foremost. During its brief life, as the life of nations is reckoned, the United States has given to the world in number of inventions more than any two of the other nations, and, as for quality, the steamboat, the cotton gin, the sewing machine, the telegraph, the telephone, the phonograph, the commercial arc lamp and the incandescent lamp form a list which cannot be approached by any other nation, and in connection with

1. Read before the Chicago Electrical Association, March 3 1899.

which but one nation, Great Britain, with the steam engine, the railway and the Bessemer process, is worthy of mention.

The idea of property, from the first gleam of ownership to the international recognition of patent and copyright property, has been a slow and labored growth. Anthropologists tell us that in the earliest stages of savagery the idea of property is unknown or very dimly outlined; that the savage first begins to assert ownership of the weapon with which he procures his food and defends his person—his club, his spear or his bow and arrow—and as though fascinated by the first sense of the right of appropriation, we find him lavishing the greatest care upon his treasured implement of livelihood and warfare, decorating it with the extravagance of his nature, placing its consideration above his own comfort, and at death, if violent, clutching it in his last death grip, if peaceful, placidly drawing the treasure to his breast to carry it with him to his happy hunting ground. The next assertion of ownership is as to those things which the savage can attach to his person, the scant raiment, the jewelry, the gew-gaws, the ringlets and anklets; as yet the growing thought has scarcely advanced beyond his immediate person. His abode, if not the natural cave or rift in the rock or tree, the home of a single night, is the property of the tribe, but in time the humble abode begins to vest itself with an idea of appropriation, and the savage, for the first time, feels that "his home is his

immovable land itself, thus giving to the individual the fixity which renders civilization possible, and far along the journey comes the recognition of property in the product of the intellect—the value minted by the mind, the thought wrought into wood or iron or stone, or embalmed in written word. Society learns that it is well to encourage efforts of the creative mind, and a franchise or monopoly for a limited time in the proceeds or profits of that which the individual creates is the best and easiest form of compensation, since it places the reward in the efforts of the individual himself, and is a spur to his efforts, and, moreover, is in the nature of an indirect tax on consumption, and is therefore easily borne by the people.

From the recognition of ownership in the first crude weapon to the recognition of property in patents and copyrights is a long journey, and they are as far removed as the club of the savage from the machine gun, the log canoe from the Oregon, or the savage's grunt from the poems of Shakespeare.

The patent system of the United States is the result of the enactment of Congress, founded on the clause of the constitution authorizing the encouragement of science and art by the granting of patents and copyrights, for limited periods, to inventors and authors. The spirit of our patent system is, however, derived from that of Great Britain, improved in many particulars, and the patent systems of the other foreign countries are modeled after that

our forefathers wisely omitted this feature, and provided for the grant of patents only to the first and original inventor. This provision encourages the effort to construct something new, rather than to spend time in trying to find and appropriate what has been previously discovered by others; and, moreover, it removes a very enticing incentive to mental theft. Franklin invented his famous open stove, and in the spirit of philanthropy which pervaded that great benefactor, determined to give the benefits thereof freely to the public, but the patent laws of England circumvented him, and an iron founder took out a patent on it in England and made a small fortune in vending it.

A few of the foreign countries have followed the example of England in this respect, while others, as Germany, France and Belgium, have followed it to a degree, since they grant the patent to anyone who applies for it, but if contested the patent will be declared invalid if it appears that the patent has been granted upon the invention of another without his consent. The patent is thus not *prima facie* evidence of validity of title. In the United States the patent will be granted only to the actual inventor, or at his request to his assignee, but the oath of the inventor to the effect that he believes himself to be the first and original inventor is a prerequisite to the grant of the patent. Some of the countries, as Sweden, Norway and Denmark, follow the practice of the United States in this respect.

While, as to this feature of granting the patent to the first to apply, England and the other countries mentioned are more liberal in the grant of the patent, it is not a liberality in favor of the inventor, but is rather a hindrance to his proper enjoyment of his rights. The American plan is evidently the more logical and just, and this fact is evidenced by the adoption of the spirit of the American idea by most of the other countries, among which may be included the colonies of Great Britain, each of which has its own patent system.

As to the remaining points of difference between the patent systems of the United States and foreign countries, it will be found that they reside in certain assistance which the United States gives to the inventor which the other countries withhold, and in certain restrictions to the enjoyment of the monopoly imposed by other countries which are absent in our system. The United States system thus offers the greatest encouragement to the inventor by assisting him to determine the true scope of his invention and by placing the fewest obstacles in the path of his enjoyment thereof, after the procurement of the patent.

The principal difference between the patent systems of the United States and foreign countries may be enumerated as follows:

1. The United States protects the inventor by granting the patent only to the first and original inventor, while some of the foreign countries grant the patent to the first to apply.

2. The United States provides an examining corps to assist the inventor in determining the state of the art and the true scope of his invention, whereas most of the foreign countries grant the patent as requested without inquiry as to novelty.

3. The United States gives to the inventor a preliminary period of two years within which to try his invention by public use to determine its practicality and value, before applying for a patent, while in foreign countries the knowledge or use of the invention in the country prior to the application invalidates the patent.

4. The United States places no requirement upon the practicing or working of the invention, while foreign countries usually require the putting of the invention into practical operation within a definite period.

5. The United States places no restriction upon the importation of the patented device, whereas such restriction is imposed by some of the foreign countries.

6. The United States requires the payment of no taxes after the grant of the patent, whereas the foreign countries usually exact a yearly tax or annuity, increasing from year to year, the failure to pay which causes a forfeiture of the patent.

7. In some of the foreign countries a compulsory grant of licenses is provided for, where the patentee refuses or is unable to fill the demand for the article, while in the United States compulsory licenses are not provided.

8. In the United States the term of the patent begins to run from the grant of the patent, while in the foreign countries the term usually dates from the filing of the application.

9. Some foreign countries provide that the domestic patent shall expire with the first foreign patent to expire on the same invention. About a year ago a similar provision in the laws of the United States was repealed.

Besides the above there are many differences of minor importance.

The first distinction referred to above has already been discussed.

As to the second, the examining corps as provided in the United States comprises a number of trained experts experienced in the various lines of industry, who, upon the filing of an application for a patent, examine into the novelty of the invention and make a report thereon. The letters-patent are in the nature of a contract between the inventor and the government, the consideration flow-

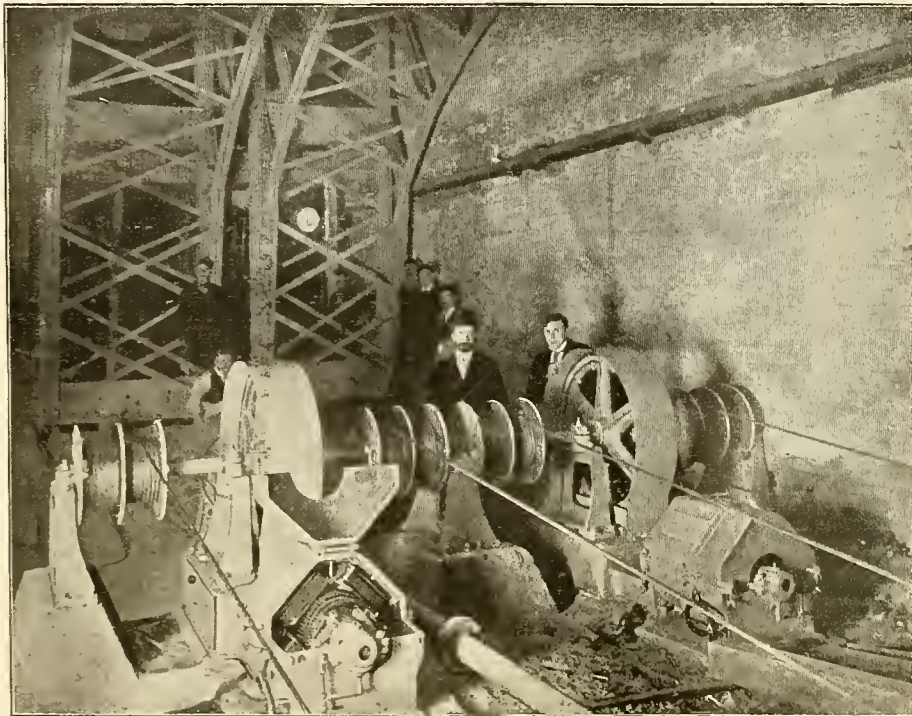


FIG. 1. ELECTRIC STAGE ELEVATORS.—MOTOR MECHANISM.

palace," and defends its temporary locality with his life. With the ownership of the home there come the various household implements, simple at first and few, but gradually increasing in number and growing in complexity. As yet, however, his simple mind can conceive ownership only in that which he can grasp in the hand, which he can lift and carry away; but as he begins to tame the animals that co-inhabit the land of his roamings, a widened sense of property appears, but as yet not advancing beyond those things which are movable—chattels, as the law names them. In the pastoral stage ownership of the land is unknown; temporary occupation of the land upon which the flock is for the time grazing is asserted—the easement, as it is called, is recognized or fought for; but so soon as the fodder is well cropped, the flock moves on to fresh fields. It is only when man begins to till the soil that the sense of the right to appropriate and own the land finds its birth. The annual or periodic crop, needing constant watching and care, necessitates the exclusive enjoyment of the soil, and with the individual thus bound to the earth, the seed of civilization is, as it were, planted. Fixed in locality, and no longer put to the necessity of frequent removal, the rude hut of hides or bark gives way to the more permanent structures of wood and stone, and in the leisure between the hours of toil the mind becomes free to think, and the constant sight of the clumsy home leads to its embellishment within and without, and architecture appears, and in the ever-present attempt of man to lessen labor and increase leisure, labor-saving devices begin to appear, simple at first and confined to the home and the farm, and thence ramifying to the thousand and one pursuits which growing civilization soon creates.

That the growth of the idea of property is slow is thus apparent, recognizing first the essential of life and existence, then passing to things that can be appropriated to the person, then to movables generally, and, finally to the

of Great Britain, with the frequent embodiment of more or less of the characteristic features of the system of the United States. While it cannot be questioned that the systems of foreign countries contain some points of advantage over our own, the patent system of the United States, by its remarkable and unequalled success, must be admitted to possess, as a whole, advantages over all other systems. It is worthy of note that the amendments in the laws of foreign countries have rather been a departure from the mother system of Great Britain and an approach to the system of the United States.

In the very early days, when England began to awake to the importance of her growing foreign trade, the little island, begirt with harbors from which her ships sailed out in all directions, sought to encourage manufactures and industries within her borders, as these she recognized to be the foundation of trade. In order to spur her fearless traders to penetrate every corner of the earth, patents of monopoly were granted, not only to those who should from the recesses of the mind bring to light new inventions, but also to those who by their travels abroad should learn of an art or industry and who should introduce the knowledge thereof into England. A system of monopolies was thus built up, which, in effect, parceled out the trade of the nation to various monopolists, each exclusively controlling some particular branch of industry, like the sale of salt, tea and the like. These monopolies led to abuses and the corruption of government, as is usually the case with prolonged franchises, and, finally, a law was passed wiping out all monopolies, and providing only for the grant of patents for a limited period to the producer or importer of a new invention or discovery. England thus retained the feature wherein patents are granted to one who introduces the knowledge of the invention into England, even though he be not the first inventor, and this feature is present in the English patent system to-day.

In the drafting of the American patent system

ing from the inventor being the complete disclosure of his invention so that the public may enjoy it after the expiration of the patent, and the consideration on the part of the government being the grant of an exclusive monopoly to practice the invention for a term of years. The examiners are, in effect, attorneys for the government, and the application for a patent is in the nature of the first draft of a contract which is submitted for their consideration. In the application the inventor outlines the scope of the monopoly to which he believes himself entitled in view of the prior art as the inventor understands it. If, in his examination, the examiner discovers prior patents, publications or uses which render the real invention narrower than the inventor supposed, he is called upon to redraft his claims, which set forth the essential novelty of the invention. By amendment the inventor brings his claims to the scope commensurate with the state of the art, and as thus amended the application matures into the letters-patent. If the examiner finds no novelty in the invention, the application is rejected upon the cited instances of prior invention. From an adverse decision of the examiner an appeal lies to the Board of Examiners-in-Chief, consisting of three judges, and from their adverse decision appeal may be taken to the commissioner of patents, and from his decision to the Court of Appeals of the District of Columbia. As a final resort the inventor may bring a bill in equity in the Federal courts to compel the commissioner of patents to issue the patent. The inventor thus has ample recourse if he considers the action of the examiner erroneous.

Germany has adopted the American system of examination as to novelty preliminary to the grant of the letters-patent, as have also to a degree Canada, Denmark, Sweden and a few other countries. With the exception of Germany, however, the examinations are not rigid or efficient.

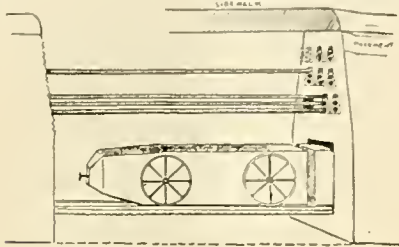
In Great Britain, France and Belgium no examination as to novelty is made, and the letters-patent are granted upon the application as filed if the papers are formal. The result is that the patentee does not know whether his patent covers a novel invention or one which has been re-patented a number of times. An examination of English patents discloses the fact that the same invention is repeatedly patented unknowingly by different inventors, and such subsequent patents are, of course, invalid. If he would know whether or not his invention is patentable he must determine by a private examination at considerable expense what the government by the division of labor could perform for a merely nominal sum.

The examining system, however, presents in prac-

Electric Mail Transmission in Conduits.

Some time ago the WESTERN ELECTRICIAN described and illustrated the system invented by Mr. N. Sampson of Chicago for imbedding conduits for electric wires in curbstones made of concrete. This combined curb and conduit system leaves the middle of the street in undisturbed possession of sewer, gas and water pipes and is claimed to have many advantages, one of them being that of "relieving the electrical conscience forever of all blame for torn-up streets and poorly replaced pavements."

An interesting development of this system is the proposal to make the curb large enough to contain



ELECTRIC MAIL TRANSMISSION IN CONDUITS.

ducts of sufficient size for the electrical transmission of mail in miniature railway carriages. It is thought to be entirely practicable to transmit sacks of mail between the main postoffice and sub-stations in cities and between the postoffice and railroad stations by this method. The accompanying sketch shows roughly the outlines of the scheme, the ducts for electrical conductors being placed in the upper portion of the curb and the conduit for mail transmission in the lower part. Of course the conduit will not be large enough to permit a motorman on the train, but Mr. Sampson claims to have worked out all details of the scheme, such as the switching of cars and their automatic stoppage at the proper point. Owing to the requirements of the patent laws, however, he does not desire to make these details public at present.

It is asserted that the electrical transmission scheme is much superior to pneumatic tubes, owing to its greater possibilities in the way of capacity and speed. Second, third and fourth-class mail matter could be handled in pouches as well as letters, to which the pneumatic system is confined. Postmaster Gordon of Chicago made a report on the subject to the postmaster-general last year, and his

Touching the relative capacities of the pneumatic and other systems, the postmaster makes some interesting observations. He says: "About 60 tons of local mail are interchanged every day between six principal railroad depots and the general postoffice [in Chicago]. To transport any large quantity of mail through pneumatic tubes in any reasonable time it is necessary that the mail should proceed in a regular manner. If, for instance, 10 tons of mail were set down in front of the opening of a pneumatic tube in our temporary postoffice and there was just half an hour to make the connection at the Union Depot, three-quarters of a mile away, I venture to say that connection could not be made. On the other hand, if these same 10 tons of mail were loaded on wagons at the temporary postoffice and the wagons then driven to the Union Depot the connection could be made within the time specified. Such would also be the case if electric or cable cars were used."

"In the use of pneumatic tubes bulk would have to be broken at one end and restored at the other, and these things would constitute a bar to the successful connection of the mail. In the case of the wagon, electric or cable systems bulk would not have to be broken, and there would be an orderly progression. To transfer to tons of mail in a short time a tube would have to be large enough to convey a good-sized package. I believe that the largest tube that can be used in order to make the pneumatic system commercially profitable is a 10-inch tube. A tube of such size would be of little value to the Chicago postoffice." A tube 48 inches in diameter would be necessary for the largest sacks of mail.

Electric Stage Elevators.

In the remodeled Drury Lane Theater in London the stage is made in movable sections. These sections are really the platforms of electric elevators, and two have been equipped for operation. The platforms are carried on bridges and are about 40 feet wide and eight feet deep. The bridges are made of two light steel arched lattice girders of simple but substantial design; they are 38 feet 10 inches in length, spaced five feet six inches apart in one elevator and five feet two inches in the other, and well braced together to form one rigid structure, on the top of which the flooring forming part of the stage is fixed. The steel portion of each movable stage section weighs a little over 4½ tons; the wooden platform, which forms part of the stage floor, together with the joists on which it rests, weighs about 1½ tons more, the total weight being between six and 6½ tons. From four to 4½ tons of this total weight is counterbalanced.

The elevators have been designed to travel from the mezzanine floor, situated eight feet six inches below the stage, to a height of 10 feet six inches above the stage, and to insure smoothness and silence in working, with freedom from "binding," the ends or legs of the girders have been made of a considerable depth, sliding in angle guides attached to substantial steel stanchions.

The elevator mechanism is placed entirely below the platforms, in order to allow a clear uninterrupted floor when the tops of the lifts are "flush" at ordinary stage level. Each section has a totally independent and complete set of mechanism to work it. Power is supplied from the electric mains to a four-pole enclosed-type, shunt-wound motor, which develops 7½ horse power at 520 revolutions per minute, but is capable of working at higher rates on emergencies. The speed is reduced in the ratio of 104 to one, through a large worm and worm-wheel, as shown in Fig. 1, the worm-wheel being geared to a shaft which carries two winding drums making five revolutions per minute. Upon these drums are wound steel-wire ropes, which pass over guide pulleys and are connected to four places on the legs of the section—one near each corner. The speed of lifting, corresponding to the full speed of the motor, is 16 feet per minute, which can be reduced through resistances in circuit with the motor to six feet per minute.

There are compensating arrangements for equalizing the tension in the ropes, so that the pull is quite steady and uniform. The movement is controlled by a combined starting and reversing switch, which is operated by a man at a station below stage level, so placed that he can see the elevators. A hand gear is provided for working each elevator in case of failure of the electric power, and automatic safety appliances are in position to operate in case of emergency. Automatic switches cut off the current from the motor in case the attendant should forget to throw the switch at the right place. Gear is also arranged to lock the "bridges" in certain positions when used as part of a fixed scene. A large factor of safety has been allowed in apportioning the strength of the various parts of the mechanism.

The elevators have been thoroughly tested, and have worked with great smoothness and without any jar or shock on starting or stopping. They were designed to carry a live load of two tons, representing the weight of about 30 people, but they have during the tests operated much heavier loads than this. Fig. 2 shows each platform loaded with a coach weighing 3,200 pounds and several people.

The description and illustrations are taken from the *Electrical Review* of London.

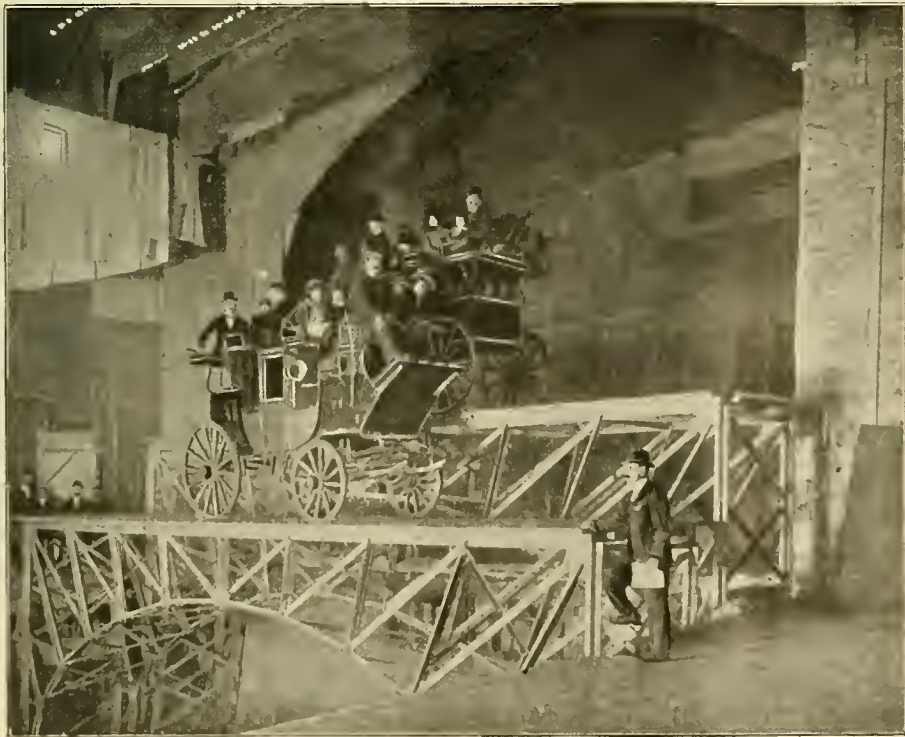


FIG. 2. ELECTRIC STAGE ELEVATORS.—PLATFORMS ELEVATED UNDER LOAD.

tic one objection which is avoided in the English system. In the American system the inventor's rights are determined by the language of the claims which he accepts in his patent, and if he accepts claims narrower in scope than he might have obtained he is held to have abandoned what he fails to claim. An unskilled attorney or an obstinate examiner may thus lose to an inventor the true fruits of his invention. The failure of the inventor or his attorney to claim all he was entitled to claim, or the refusal of the examiner to allow a claim as broad as the inventor considers his invention to support.

conclusion was unfavorable to the pneumatic tubes; he favors the cable or electric system. On the question of speed he says: "If pneumatic carriers travel from the postoffice to the Union Depot at 60 miles an hour they are two minutes in transit. If it requires 10 minutes to load and unload the carriers and to pouch the mail the actual speed between these points is 12 minutes. If, on the other hand, the cable or electric system could take pouches and sacks and could convey them from the postoffice to the postal cars at the rate of 12 miles an hour, including the time for loading and unloading, the actual speed would be five minutes, or seven minutes less than the time taken by the pneumatic system."



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According to cable despatches in the daily papers from London the government has announced its intention to engage in the telephone business, and an appropriation of \$10,000,000 has been asked for the purpose of beginning the work. The details of the government's policy have not been given in the meager despatches alluded to, but it may be taken for granted from the enthusiastic support which the proposition received in Parliament that the enterprise will be given a fair trial by the government.

The attitude of the National company in England to-day is somewhat similar to that of the Bell company in this country at the time of the expiration of the fundamental Bell patents. Equally arrogant and hostile to the public, they command little respect and no sympathy in their trial. In this country the result of the policy of the old Bell monopoly is plainly seen in the encouragement that is everywhere extended to independent enterprises. Judging from the expressions of opinion in the English press, the same condition would confront the National company if the field had been thrown open to competition. Whatever the plans of the government may be, it is safe to assume that the public will welcome any change that will promise relief from the obnoxious corporation which now controls the field.

In his recent annual address Mr. J. S. Walker of Nashville, Tenn., the president of the Engineering Association of the South, quoted with approval this remark of the late James B. Francis: "It takes nine pounds of common sense to apply one pound of science." Mr. Walker made a plea for practical business methods in engineering work. The gist of his address is contained in these words: "The savants have originated little, and their mental habit is such that they cannot direct; still our debt to them is very great, and we cannot do without them. But when we come to educate the rising generation of engineers, I, for one, fear that we may have them too much educated and refined for the work they are to do; and it is more than probable that the great schools, with their refined and extended courses on subjects which are only truly taught by actual experience, while they may help and assist to train, will be found as not tending to elevate the great mass of engineers."

Mr. Walker's position will be approved by many who have had occasion to give this subject careful consideration, and his views should have influence with educators and directors of manual training, scientific and engineering schools. The subject is one of great importance to technical trades and the engineering fraternity.

Two important decisions affecting the rights of electrical corporations to occupy public highways with poles carrying wires used in the transaction of their business have just been reported—one in New Jersey and the other in New York.

The former was in the case of Benjamin Nicoll, a property-owner of Morristown, against the New York and New Jersey Telephone company, and was decided on March 7th by the New Jersey Court of Errors and Appeals. Judge Dixon, who wrote the decision, says that the use of public highways for the erection of telegraph and telephone poles does not come within the definition of public easement in that state, and he finds, therefore, that provision must be made for compensation to abutting property-owners who have a fee in the bed of the highway. A similar decision was made by the New York Court of Appeals in 1894 in the case of a property-owner against the American Telephone and Telegraph company. Judge Rufus W. Peckham prepared the opinion in that case, in which he declared that "neither the state nor its corporation can appropriate any portion of the public highway permanently to its own special, continuous and exclusive use by setting up poles therein, although the purpose to, which they are to be applied is to string wires thereon and thus to transmit messages for all the public at a reasonable compensation."

The second decision referred to was pronounced by the Court of Appeals of New York, and was also handed down on March 7th. While the principal question involved was the privileges of electric-lighting companies, the decision also had a reference to telegraphy and telephony, and it is to be noted that electric-lighting stands on a different basis from electric message sending in the view of the law, the former being recognized as a legitimate and necessary street use for public purposes, while the latter is not. The court establishes some interesting propositions in regard to this subject of lighting highways. Light, being an aid to the public in traveling upon a highway in the night time, subserves a street purpose, and in cities and incorporated villages it is declared to be not only a right but a duty of the municipal authorities to supply it. "Not so with telegraph and telephone wires," says Judge Haight.

"They in nowise preserve or improve the streets or aid the public in traveling over them." The placing of the necessary poles and wires for lighting a highway must therefore be deemed one of the uses for which the land was taken and does not impose upon it an additional burden for which an abutting owner is entitled to compensation. This rule is held to apply to rural districts as well as to more thickly populated localities, if the inhabitants are willing to pay the expense. The court intimates, however, that if the highway be only a country road, lightly traveled and where no necessity exists for light, a taxpayer might object effectively.

It is now an old story, but nevertheless an interesting one for electrical men, which is told in the "Red Book of Spain," and from which translations have been made for the American press. These excerpts disclose the effect upon the Spanish government of the interruption of telegraphic communication with the seat of war, and they establish the fact that the cable cutting in the Philippines and Cuba did more to cripple Spain than any other event excepting the decisive engagements at Manila and Santiago.

Lieut. E. Capehart, who made observations recently of the mine defenses of Santiago harbor, has reported to the government that the entrance to the harbor was protected with electrical and contact mines. The electrical mines were of the Latimer-Clark type, containing gun-cotton, and the contact mines of the Bustamente pattern, carrying smaller charges. The electrical or observation mines were planted in mid-channel, and were controlled first by two stations on the west or Socapa bank, one on Cay Smith and another at Estrella Cove, on the east bank. The station at Estrella Cove and the inner one on the Socapa bank were in the best possible positions for protection, and could have been operated even should the banks have been swept by the guns of our fleet. In the cove just beyond the Morro the operator could, in almost perfect security, observe his mine field until the ships to be destroyed were almost abeam of him, and could operate the mines long before he could have been discovered. The electrical mines were planted on the bottom in from seven to 11 fathoms, and the contact mines were anchored to float at about 11 feet below the surface of the water. The mine fields were well protected.

It has been contended that the foothold gained by American manufacturers in foreign markets is due in large measure to the marvelous perfection attained in machinery designed and constructed in this country, and that this condition can be traced directly to the encouragement and protection offered inventors by the American patent system. The multiplicity of inventions has rendered the work of the Patent Office far more onerous and difficult than it used to be; the facilities at the disposal of the commissioner are inadequate, as they have not been increased in proportion to the demands upon the office, and, as a consequence, the value of a patent is less than it should be. Meanwhile the government turns into the treasury a large percentage of the money paid by inventors for the maintenance of the Patent Office. At the present time, when American manufacturers are reaching out for foreign markets, it is believed no greater aid can be given them than by fostering and stimulating invention. The United States can only become dominant in the markets of the world through labor-saving inventions which will enable this country to compete with the lower wages paid elsewhere. The greatest development in American exports must be in manufactured articles. "In labor-saving machinery and in the intelligence of the labor employed, the United States to-day is in advance of the world." While this is true of manufacturing industries generally, it applies with particular force to the electrical workers of the country. No other industry is so dependent upon the integrity and efficiency of the Patent Office, and none has more reason to appreciate the constant watchfulness that has been exercised in its management. The fault does not lie with the Patent Office, but with Congress. The management of the office has been satisfactory, but the appropriations for its maintenance and the needed improvements of the service have been inadequate. An organized movement, representing manufacturers, inventors and the patent bar, should be formed to urge upon Congress the necessity for providing facilities for efficiently carrying on this work.

Electrical Work in Mexico.

[Prepared for the WESTERN ELECTRICIAN by the Philadelphia Commercial Museum.]

Interesting information relative to the progress of electricity and the transmission of electric power at different points in Mexico is furnished in the correspondence of the Philadelphia Commercial Museum, and some hints are furnished that may possibly benefit American electricians.

The city of Merida, the capital of the state of Yucatan, Mexico, with a population of 40,000, has only one electric-light company and no electric railway. The electric-light plant is reported as being out-of-date, and its owner and manager, Miguel Espinosa Rendon, is said to be disinclined to make needed improvements. He holds the contract for lighting the city.

The Compania de Tranvias de Merida, incorporated with a capital of \$400,000, operates 24 miles of street-car lines and owns a concession from the government for laying tracks on every street in the city. This right is exclusive and has five years to run. The company operates 45 horse cars, but is open to negotiations for enlarging the capital for the purpose of adopting electric power and extending the system before the time limit of its franchise expires. The company last year paid a six per cent. dividend. The treasurer and general manager is N. Escalante y Peon of Escalante y Hijo, Merida, with whom correspondence can be conducted in English.

Negotiations with the Compania Mexicana de Electricidad of the City of Mexico might result in orders for equipment coming to the United States that have heretofore been placed in Germany. The company was established by Siemens & Halske of Berlin. The stock of the company is held by Germans, who naturally favor their countrymen in the purchases of supplies. The company has been contemplating extending its plant at about this time, and the opportunity of introducing American equipment and supplies should not be lost. The machines in use have a capacity of 800 horse power. The superintendent is D. Luis Bacmeister, and D. E. H. Horner is business manager. The technical work is in the hands of D. F. Neugebauer. The street-railroad company, which is controlled by Americans, is contemplating the adoption of electricity on the suburban lines, and later on the city lines. Electrical lines are practically unknown in Mexico, and there should be considerable business picked up there by American houses.

The city of Leon, the capital of the state of Guanajuato, a place of 120,000 inhabitants, has an installation for electric lighting which is not giving popular satisfaction, inasmuch as \$1.25 is charged for each incandescent lamp of 10 candle power. A correspondent suggests that cheaper power could be obtained by utilizing a waterfall, five miles distant. Leon has neither a water supply nor sewerage system, and the correspondent suggests that there is a "great future there for an enterprising person or company."

Hermosilla, a city of 15,000 inhabitants, in the state of Sonora, has no electric railroad. In June last an electric-lighting plant was established by Ricardo Uruchurtu, a Mexican, and Florence Monteverde, an American citizen. The plant was enlarged in August and is giving good service. This company also owns and operates a lighting plant at the port, Guaymas. The equipment was supplied by the General Electric company of Schenectady, N. Y.

In Santa Rosalia, Lower California, there are several plants for the transmission of light and power owned by the Bolco company of Guaymas. The company supplies about 1,000 horse power to its mines, factories, etc. The plant was purchased in Oerlikon, Switzerland. The company is dominated by Frenchmen.

An electric plant, to furnish 4,000 horse power, to be generated at Atlixco, state of Puebla, for the transmission of power to the cotton mills and factories around Puebla, is expected to be soon placed in operation. The concessionaire from the state, Sebastian de Mier, a well-known millionaire, received a temporary setback from the owner of the land at Atlixco, who demanded \$50,000, but as his concession carried with it the privilege of condemning property necessary for the work, Mr. de Mier has deposited \$10,000 to cover the value of the land to be used for the turbine pit, buildings, etc. The company having the contract for the installations and operations of the plant is represented by J. W. Ebert, to whom Mr. de Mier last summer leased the power. Mr. Ebert arranged in his turn with a company to put up a plant to cost not less than \$275,000, gold.

The installation, which is to be completed by April 1st, will include four Stanley generators of 1,200 horse power each, the wires to go a distance of 20 kilometers. There will be six copper wires, and it will be a three-phase system on the basis of 10,000 volts. The hydraulic installation is to be supplied by the Pelton Water Wheel company, New York, comprising four water wheels of 1,200 hydraulic horse power each. The power thus to be furnished will serve for the lighting plant of Puebla, consisting of 250 arc lights and 2,000 incandescents, as well as for the factories and mills around the city of Puebla.

Power will be drawn from extensive hydraulic works, which have just been completed by Mr. de Mier, at a cost of \$650,000, and primarily intended by him for the irrigation of his hacienda. The power plant is in the mountains, 12 miles south of Puebla; there a dam was put in, to divert the water from the

headwaters of the Atoyac River into a canal and tunnel system, which continues in a southwesterly direction 11 kilometers further. The water passes through four kilometers of canal, then a tunnel nearly five kilometers in length through the heart of a mountain, and, finally, through 10 tunnels and a canal for a distance of two kilometers. These latter tunnels vary in length from 100 to 600 feet. The large tunnel, which is a magnificent piece of masonry, is 2½ meters in height. There are in this tunnel 22 shafts, varying in depth from 50 feet to 125 feet, and which were used in the construction.

The total length of the hydraulic system is 11 kilometers. The fall in the upper canal and tunnel is 20 centimeters per kilometer, and in the lower end of the canal it is 60 centimeters per kilometer. The sectional capacity of the canal is six cubic meters per lineal meter. The actual flowage of water during the lowest stage in the dry season of the year is three cubic meters per second, or 3,000 liters.

This exhaustless volume of water flows through four 42-inch pipes from the entrance to the canal down the mountain side, a distance of 2,500 lineal feet, at an angle of 19 to 30 degrees and with a total perpendicular fall of 469 feet. This fall of 469 feet of 3,000 liters will produce over 4,000 horse power. The same water, after passing this first fall, is conveyed further down the valley upon the mountain side, some four kilometers, until another elevation is reached of some 200 feet above the valley, an elevation with a water supply capable of producing an additional 2,000 horse power, being a total at both falls from the same water of over 6,000 effective horse power to be utilized when the electric installation is completed for Puebla. Later on the same company may bring power to the City of Mexico.

BOOK TABLE.

ARMATURE WINDINGS AND ARMATURE CONSTRUCTION OF DIRECT-CURRENT DYNAMOS. By E. Arnold. Berlin: Julius Springer, 1899. (Third edition. With 418 illustrations in the text and 12 plates.)

The electrical fraternity has long been in anticipation of the appearance of a translation of the second edition of the above work, announced nearly a year ago as in preparation. When it does appear it will be welcomed no less heartily because of the publication within the last few weeks of the third edition, in the original German, of this valuable work. It is not improbable that the English translation will be corrected to date and embody the later developments contained in the present third edition. In any event, those investigators and practical men who are able to read the original will have access to a valuable work.

Unlike some works on this and other technical subjects that are intended for the use of the expert, this book is equally well adapted to the beginner, or perhaps the less advanced of students of practical electricity, for it begins with a very lucid explanation of the phenomena of induced currents, and by steps, both mathematically and graphically set forth, leads the reader by natural and gradual stages through the elements of the subject on to the intricate combinations of the various phenomena as experimentally tried and commercially carried out in practice. A spirit of catholicity pervades the whole work and attests to the author's unbiased mind and universality, for throughout American, English and German apparatus and methods are treated with refreshing impartiality.

The illustrations, which average more than one to a page, consist of reproductions from photographs of the actual armatures, but more largely of reproductions from shop working drawings, reduced to a convenient size to make them perfectly legible, and yet not so large as to be unnecessarily unwieldy, as is the case with one or more otherwise excellent American works. The combination of descriptive and mathematical text with the plan of profuse illustration, together with the world-wide fame of the author and the thorough up-to-date character of the work contributes to make the appearance of the volume something of an event in the electro-technical world.

Nernst Electric Light.

It is disclosed in the prospectus of the new English company bearing the name of the "Nernst Electric Light, Limited," that the rights of this invention—this new lamp which Mr. James Swinburne declares is "the greatest invention in electric lighting since the infancy of the industry"—are controlled by George Westinghouse for North America, Ganz & Co. of Budapest have the rights for Austria-Hungary, Italy and the Balkan states, and the Allgemeine Elektrizitäts Gesellschaft of Berlin controls the patents for the remaining European countries. The Nernst Electric Light company's territory is Asia, Africa, Australasia and South America, certainly large enough in extent to satisfy any moderate ambition. The capital of the company is £320,000, and the purchase price of the Nernst rights is £270,000, leaving a working capital of £50,000.

Nernst's invention consists in the use of a rod of highly refractory oxide instead of carbon as a light-giving body in incandescent lamps. Such materials are insulators when cold, but when heated are conductors, and as they stand a much higher temperature than carbon they can be run at a much higher electrical efficiency. As the oxides are not consumed, a vacuum globe is unnecessary. Large Nernst

lamps contain an electrical heating hood, to get the rods hot enough to begin to conduct. As soon as the rod takes the current the hood is cut out of circuit automatically. The rod itself, with the two wires on which it is mounted, is easily replaceable. In smaller lamps the movable hood is replaced by a stationary heater, so that the lamp is cheaper and simpler. No figures are given as to the cost of the new light to the user, but the company claims that there will be a great demand for the Nernst lamps and that in many cases existing lamps will be forced out of competition. The general attitude of the electrical public in England seems to be that of benevolent incredulity.

The WESTERN ELECTRICIAN is in receipt of a communication from Theodore Reyman of 46 First avenue, New York, who requests the publication of the following statement: "Having experimented with the higher oxides used by Professor Nernst, I have designed a new form of lamp which obviates the long wait before the oxide conducts the electric current. The method I use is the employment of an arc lamp, the upper carbon of which is raised by a magnet connected in series to form an arc. Around the arc I have placed a hollow cylinder of oxide connected in shunt around the arc. When the switch is turned no current flows through the oxide, but as the carbons complete the circuit the magnet raises the upper carbon, and the arc thus formed heats its jacket of oxide, which soon conducts the electric current under the intense heat evolved, and becomes incandescent. The arc between the carbon electrodes is broken, owing to the increased length of the arc and the reduced current which now passes through the incandescent cylinder of oxide. The upper carbon is fed by gravity when the current is turned off and is prepared to again impart the initial heat. I have successfully operated three such lamps, connected in series on 110-volt direct current."

At the meeting of the electrical section of the Franklin Institute of Philadelphia, held on February 28th, Professor Franklin of Lehigh University showed a new type of lamp made by himself, on the same principle as that invented by Professor Nernst of Goettingen University. The lamps shown were glass tubes about two inches long by one-fourth inch in diameter, filled with magnesium mixed with powdered glass, a platinum terminal contact being sealed in each end of the tubes. In Professor Franklin's experiments with these lamps he has secured a very satisfactory light.

American Manufactures in Russia.

[From the Washington correspondent of the WESTERN ELECTRICIAN.]

WASHINGTON, D. C., March 11.—Late advices state that our diplomatic officers at St. Petersburg, Russia, have been consulting with American residents of that city and Moscow, as well as American manufacturers who have visited the Russian capital during the last year, as to the advantages to be derived from an American exposition to be held in St. Petersburg in 1901, immediately following the Paris Exposition, as the best method of introducing and advertising goods and affording American manufacturers an opportunity to become acquainted with Russian merchants and familiarize themselves with the kind of goods adapted to that market and the methods of doing business. Such an exposition, it is pointed out, would result in the establishment of a Russo-American bank to handle American business, a commercial agency to report on the standing of business men in both countries, as well as an international express company and parcels post—all of which are essential to the proper development of trade with that rapidly growing country.

While some American manufactures are recognized by Russian importers and consumers as the best of their kind and are sold in large quantities, American manufactures in general are both discredited and handicapped in Russia, and the introduction of new goods made extremely difficult, for two reasons. The first is that European manufacturers, Germans especially, fill the Russian markets with inferior goods stamped, trademarked, etc., as "American," which, being accepted by the unsuspecting Russians as genuine American productions, discredit our manufactures to such an extent that nothing short of active and persistent personal effort can push new articles into general use. The second reason which operates against the introduction of American manufactures is the long credits given by the British, French, German and other manufacturers—credits based upon the reports of their agents, who traverse the empire and know exactly how far credit can be safely given.

The proposed exposition would overcome both these difficulties and would undoubtedly result in our manufacturers securing a much larger share of the trade of Russia. It would be a national advertisement of American industrial skill, and would be far-reaching in its results. Such an exposition as the one proposed is like a window display on a gigantic scale, in which are placed on view choice samples of the national stock in trade, which attract the thoughtful attention of prospective buyers. The electrical industry is as much interested in this export question as any other industry, and our electrical manufacturers should keep this proposed exhibition in mind and be alive to the value to be derived from making a creditable exhibit. A. F. T.

DEVELOPMENT OF THE TELEPHONE FIELD.

Telephone News from the Northwest.

[From the Minneapolis correspondent of the WESTERN ELECTRICIAN.]

The Albia, Ia., telephone system has now 175 instruments in use.

C. M. McFatrige of Moravia, Ia., has sued the Ottumwa Long-distance Telephone company for \$1,350. Mr. McFatrige owned a line connecting Moravia and Blakesburg, which he sold to the defendant for \$1,500. The company paid him \$500 and was to pay the balance soon after, but he claims this has not been done, and sues for \$1,000 and interest, making a total of \$1,350.

The Iowa Telephone company announces that Nevada, Ia., will have all-night service hereafter. The new mutual telephone company at Nevada is having gratifying success in getting subscribers. About 75 instruments have been ordered, and more are in sight.

The town of Brighton, Ia., will vote on March 27th on granting a franchise to Robinson & Wilson for the Washington Telephone company; also to the Jefferson County Telephone company.

Fonda, Ia., will vote on March 27th on granting a telephone franchise to George Sanborn and others.

The Mutual Telephone company of Des Moines, Ia., has won its contest to get more of its instruments placed in the statehouse. The state executive council has ordered five new connections made, giving the Mutual nine instruments in the capitol building.

An effort is being made to secure sufficient subscribers at Renville, Minn., to put in a telephone exchange.

F. A. Meacham is working to establish a telephone exchange in Edgerton, Minn.

The council of St. Paul has passed a resolution asking the Legislature to take action to regulate the rights of telephone and telegraph companies. It calls for an amendment to prohibit such companies from occupying streets in cities without the consent of councils of the cities.

Some malicious person near Chippewa Falls, Wis., has been cutting the toll wires of the Chippewa Falls Telephone company. A reward of \$100 for the arrest and conviction of the perpetrator has been offered.

The council committee of Duluth, Minn., reports that it would cost about \$100,000 to install a telephone system for the city, and thinks that a plant cannot be operated on the rates proposed by a new company—\$30 and \$20 per annum—without losing money. The council left the matter of a new system, which is strongly favored by the mayor, to be settled by the incoming council.

The Great Northern Railway company cut down about 60 poles of the Northwestern Telephone Exchange company along its right-of-way between Orr and Inkster, N. D. The people on the line were indignant at the interruption to their telephone service. It arose from a right-of-way dispute.

Ex-Congressman Boen of Fergus Falls, Minn., is agitating the question of township telephone systems for the benefit of farmers. He thinks a system to connect with 100 dwellings in a township could be built for \$3,500, and in many localities the residents could do a great deal of the work. He thinks the Legislature ought to make provision for operating township telephone exchanges.

Ida Grove, Ia., will vote on March 27th on granting the Iowa Telephone company a franchise.

Gleason & Sleight of Ashland, Wis., are said to have begun suit against the Wisconsin Telephone company for damages alleged to have been the result of incompetent service. The complaint alleges that there is long delay in answering calls by the operator, and the service is very unsatisfactory in many ways.

The Standard Telephone company proposes to connect its toll system with Garnavillo, Ia., from Elkader to Guttenberg.

The Farmers and Traders' company of Fremont, Ia., has been formed to build a telephone system to connect with other cities and towns in the vicinity.

The Central Telephone company of Des Moines, Ia., is an applicant for a franchise at Pella, Ia.

The Rushford (Minn.) Telephone company is understood to be preparing to build toll lines in the spring to Albert Lea, Minn., on the west and Minneapolis on the north. It will connect with the independent exchange being constructed in Minneapolis.

The Badger State Telephone company will put in a telephone system at Milton, Wis. The company connects with 30 towns in Rock County and with other parts of the state.

The town of Odobolt, Ia., will vote on granting Clold H. Smith a franchise for a telephone exchange. He offers to give all-night service if he can secure 75 subscribers.

The Clearfield and Mount Ayr Telephone company is arranging with a number of people at Mount Ayr, Ia., to give them several bulletins daily of Chicago stock-market quotations.

In less than a year the telephone system at Glenwood, Minn., put in by J. J. Greaves, has reached 60 connections. Mr. Greaves contemplates extending a line to Green Isle, Minn., and connecting with the Sibley County system.

Avoca, Ia., votes on March 27th on granting a franchise to the Nebraska Telephone company.

The town of Sutherland, Ia., will vote on March

27th on granting franchises to the Iowa Telephone company and to the Nebraska Telephone company. The Owatonna (Minn.) Telephone company has installed a new switchboard of 240 drops.

Telephone Rates for New York.

The Marshall bill providing for lower telephone rates in New York has been transferred from the finance committee to the committee on miscellaneous corporations in the Senate, and as the latter committee has heretofore shown its hostility toward measures of this character it is feared that the present bill will be permitted to slumber until the close of the session.

The bill provides maximum rates for telephone service in the cities and towns of the state, and gives authority to the controller, the attorney-general and the state engineer to enforce the act. The sum of \$15,000 was to be appropriated to pay the expenses of the commission, and therefore the measure was consigned to the finance committee. The supporters of the Marshall bill felt more confident of a favorable report from the finance committee than from any other committee in the Senate.

Subsequently, however, the majority of the Republican members of the committee decided to give the bill to the committee on miscellaneous corporations. It was held a day by the action of Senator Brown (Republican) and the Democratic members. Then came a ground swell, from New York apparently, which affected all the Democratic members but Senator Douglas of Albany, who happened to be absent, and there was a practically unanimous desire to send the bill to the committee on miscellaneous corporations. This decision was made, but before the bill was sent back to the Senate the appropriation of \$15,000 was taken out, which would leave the State Telephone Commission, if it should be organized, without funds to carry on its work.

Senator Higgins, chairman of the finance committee, said on presenting the bill to the Senate, that the cancellation of the \$15,000 appropriation left the bill without reason for being in the hands of his committee, and it should be sent to the committee on miscellaneous corporations. He was sustained in this action by Republican and Democratic members of the finance committee, and the Senate approved the report.

In the hearing before the senate committee on miscellaneous corporations Senator Marshall presented the chief argument. He was supported by Frank S. Gardner, Silas M. Giddings, G. Waldo Smith, D. G. Osgood and L. J. Callanan, representing the New York City Board of Trade and Transportation; Dr. George W. Brush of Brooklyn, Dr. William Murr, representing the New York city druggists, and R. M. Walters, Edward J. Gavegan, Andrew Patterson, William F. Russell and Amasa Lyon, who appeared on behalf of the Merchants and Manufacturers' Board of Trade of New York city. They argued that the present telephone rates could almost be cut in two and still leave a sufficient margin of profit. They urged that the people of the state demanded a reduction in the telephone rates. The other telephone rate reduction bills were also incidentally discussed.

Slump in Bell Securities.

[From the Boston Traveler.]

In the Boston market, which, like Wall street, was strong in the early dealings and then weak, the strength in the Dominion, Coal and General Electric and the slump in Centennial and Bell Telephone were the features.

[From the New Haven Register.]

Bell Telephone, which has been as high as 372 within the last few weeks, has dropped to 360, and to-day did not rise much higher. No assignable reason is to be formed for the decline, well informed telephone men laughing at the rumor that Bell Telephone is being injured by the rival companies starting up.

[From the Worcester Spy.]

Bell Telephone fell 28 points to 335, against highest on this year's rise of 378, also a high record. Bell began the year at 273, rising \$105 per share in six weeks; it sold at 238 11 months ago, as low as 163 exactly five years ago yesterday, and at 76 in 1880. In 1883 it got up to 299; last year's highest was 285, in August. It rallied 12 yesterday to 347, or a net loss of 11 at 2 p. m. for the day.

[From the Des Moines Leader.]

The Bell Telephone company is distributing a circular through the state giving notice that it will increase its capital stock of \$1,500,000 to \$2,000,000 and that a meeting will be held in Davenport to get subscriptions; also that the extra money is for improvements. Rivals of the Iowa company claim that it has not paid dividends on its stock in two years because of the bitter competition it has been waging against the independent exchanges, and that, on the other hand, it has been required to increase its bonded debt and to secure money from other sources to make betterments and carry on the fight.

The Telephone Situation.

[From the Chicago Record.]

The tendency toward trusts among industrial enterprises is strikingly illustrated in the present movement in the so-called independent telephone manufacturing field, having for its object a combination of the companies engaged in this industry. These concerns have been supplying the apparatus for the telephone exchanges which have been established in opposition to the Bell interests, and their popularity has been due in large measure to their attitude toward the old monopoly and their encouragement of the local telephone enterprises which have brought about reductions in charges for telephone service. Competition has worked to the advantage of the public by destroying the old monopoly and preventing the anti-Bell companies from exercising similar power. It has also had a tendency toward securing needed improvements in the exchange service, and this advantage is of as much importance to subscribers as the reduction in prices brought about through the same agency.

The reasons advanced by the promoters of the proposed combination are the disastrous effect that indiscriminate competition has had on the trade and the difficulty experienced in securing the necessary funds for developing the enormous business that has grown up so suddenly. From the beginning the chief difficulty of the independent telephone manufacturing companies has been insufficient capital to develop their business. Many of them have been tempted to extend their operations beyond the limits of safety, as judged by actual cash investment, and as a result they are constantly "hard up," although they are conducting an unusually profitable business. It is this feature that has led them into the scheme for consolidation. A strong combination, it is believed, could absorb all the little plants and run them much more economically than they could be conducted under separate management. The business is increasing steadily and is growing more profitable as methods of manufacture are simplified and systematized. These advantages would enable a trust to place a liberal valuation upon the plants and the business turned over by the several companies, and thus the present owners would be enabled to realize in cash a portion of the money and time they have devoted to the building up of the industry. But the most important feature would be the improvement in the financial standing of the business. The present owners would, of course, receive compensation principally in stock of the trust, which would be listed and have some market value, in striking contrast to the securities of existing corporations. But in placing this stock on the market there would always be the danger that the old monopoly would buy it up, if, indeed, that corporation did not gain control at the outset through connivance on the part of promoters of the trust.

It is evident that those who are engaged in the formation of this trust are not entirely actuated by a desire to serve the public or to promote the interest of the anti-Bell movement, as they have arranged for the placing of securities upon the market far in excess of the present value of the plants engaged in this industry, and for this reason alone the managers of independent exchanges are bound to view the movement with disfavor. There is no doubt that the successful execution of the plans of the promoters of the combination would prove a serious setback to the independent movement, as it would destroy public confidence in it and alienate the sympathy which has proved such a valuable factor in the struggle against the Bell monopoly.

[From the Binghamton Republican.]

The telephone companies outside the Bell monopoly are forming a combination to compete with the Bell. That step has a suspicious appearance. It is probably a step to combine with the Bell, if the Bell can be induced to let them in.

Berliner Litigation.

J. D. Leatherbee, treasurer of the National Telephone Manufacturing Company of Boston, writing upon the Berliner litigation which is still pending between the American Bell Telephone company and the National company, says that "the defense of this suit for three and one-half years has absorbed all of our money and a goodly quantity of our energy," but he adds: "You must agree with us that there is no other course for us to pursue than to fight this thing to a finish. Never for a moment have we despaired of ultimate success, but the prestige, energy and unlimited means of the Bell company require, of course, an adequate and approximate defense. You can readily understand what that means in the matter of expense.

"We trust our efforts will soon be rewarded by an opinion that will relegate this so-called Berliner invention to the oblivion from which it should never have emerged, and this country be freed from the 'club' which this suit has caused to be suspended above the heads of the American people—a weapon intended to paralyze the business of the National Telephone Manufacturing company, while interposing between the monopoly and all manufacturers and users of free telephones."

New England Telephone News.

[From the Boston correspondent of the WESTERN ELECTRICIAN.]

The American Bell Telephone company has bought another piece of real estate, this time on Milk street, Boston, adjoining its present building. The property is a four-story building on 3,395 feet of land. The present occupant has a lease running two years. This gives the company a total area of 19,222 feet at the corner of Milk and Oliver streets. It also looks very much as though the company intended to remain in Boston a while longer, despite the rumors that the offices are to be transferred to New York.

The American Bell Telephone company's statement of instrument output for February, although a record-breaker, promises to be outdone by March statistics, for the orders received during the last four or five weeks indicate that a larger number of instruments have been installed than ever before in a similar period. The gross output for February was given as 49,263 instruments; returned, 13,476; net, 35,787. This makes the total outstanding at the time of the February statement 1,192,862, against 951,180 a year previous, 793,550 two years ago and 627,445 three years back. The net gain for the current month is expected to exceed 40,000.

The Cambridge, Mass., Board of Aldermen on March 7th referred a petition for a franchise from the Massachusetts Telegraph and Telephone company to the committee on roads and bridges.

Farm Telephone Service in Illinois.

[From the *Agriculturist*.]

It may please the farmers and others to know something about the working of several lines of our farm telephones here in Mason County, Illinois. Our telephone service was inaugurated March, 1897, by Ralph Bowser, a young man but 20 years old, an enthusiast in electrical work, who connected his father's house and nearest postoffice by a line a mile and a quarter in length. The upper wire of a barbed-wire fence was used at first, and worked so well that I remember hearing distinctly a watch tick over this line. From this small beginning has grown a system of seven separate lines, 21 miles in length, using 38 telephones, and more are wanted. Our telephones cost \$8 each, wire three cents per pound or \$4.50 per mile. The battery with each telephone is effective six months without attention. The use of our telephones is free to all. The practical utility is evident, but the use as a means of social entertainment is not so well understood or appreciated as it deserves. We frequently listen to piano solos and songs, also to Sousa's last marches played by a graphophone before a telephone three miles away, and by simply turning a switch two lines are united and the graphophone can be heard at 24 telephones.

Public-spirited Promoter.

An incident in the controversy over granting a new telephone company in Topeka, Kan., an ordinance enabling it to compete with the old Bell company illustrates the fact that movements of this kind are in the interest of the public and not entirely money-making ventures. J. S. Bear, manager of the new company, has made the following proposition: "I stand ready to treat the people of Topeka with entire fairness, and I now propose that the City Council adopt the suggestion of Councilman Skinner, with reference to the Bell company reducing rates, and I hereby agree to enter into an agreement to withdraw from the field and not to ask for a franchise. My only condition is that the Bell company shall enter into a contract with the city to reduce the rates to \$24 for business and \$18 for residence telephones, and that it bind itself by an irrevocable agreement to keep the rates at these figures for 10 years."

Crippling Competition.

The Bell interests are utilizing their influence with other large corporations, especially those controlled in the East, to cripple the service of independent companies in small places. An example of this kind is furnished in central New York, where local companies have been ordered to remove their instruments from railroad, freight and express offices. The *Chenango Union* furnishes the following particulars of one fight:

Mr. J. B. Marquis, manager of the Marquis telephone system in Norwich, N. Y., has received from A. C. Salisbury, superintendent of the Utica and Binghamton division of the Delaware, Lackawanna and Western railroad, and W. C. Hartigan, superintendent of the northern division of the New York, Ontario and Western railroad, notices, similarly worded, conveying the information that the Central New York Telephone and Telegraph company had made contracts with their respective railroads, under the terms of which the company is entitled to the exclusive privilege of placing telephones in the offices and stations of the railroads. Mr. Marquis is ordered to remove his telephones from railroad property. This is a new attempt on the part of the Central New York company to strike at the Marquis system. The first attempt was made nearly a year ago, when the Marquis telephones were ordered out of the offices of the United States and Adams express companies in this village. The owners of telephones in the Marquis system caused such a commotion at this time, and coincident with the order there was such an increase in freight traffic and decrease in express traffic, that the express companies speedily revoked the order. The second attempt has a more secure foundation. It is based upon a contract between the telephone company and the railroads, whereby the telephone company grants to the railroads the free use of the system in case of emergency when telegraph wires are down, etc., and in return for which the telephone company is granted exclusive right to place telephones in the railroad offices and stations. In justice to Mr. Hartigan, who is a resident of Norwich, it should be said that he was not a party to the agreement, and was simply obeying instructions in sending the notice referred to by Mr. Marquis. The order removing the Marquis telephones from the railway offices, especially from the freight offices, will cause some inconvenience.

ANNUAL MEETINGS.

The stockholders of the Interstate Telephone company, Durham, N. C., have elected L. A. Carr president, George W. Watts vice-president, J. S. Carr treasurer and W. W. Shaw secretary.

The Xenia, O., Telephone company has selected the following named officers for the first year: President, E. H. Schmidt; vice-president, H. M. Barber; secretary, J. C. Conwell, and treasurer, Marcus Shoup.

The following named officers have been elected by the Scuyler Telephone company of Iliou, N. Y.: President, Rufus H. Smith; vice-president, John M. Budlong; secretary, William Sterling, and treasurer, Dr. S. S. Richards.

At the annual meeting of the stockholders of the Richmond (Va.) Telephone company March 6th John C. Robertson and Warner Moore were re-elected president and vice-president, respectively, with substantially the same board of directors. A most encouraging report was presented of the company's operations during the fiscal year.

At the annual meeting of the Cumberland Telephone and Telegraph company in Hopkinsville, Ky., March 2d, it was decided to increase the capital stock from \$3,000,000 to \$6,000,000. The additional stock will be sold to present stockholders in proportion to the amount each now holds. The board of directors elected the following named officers: James E. Caldwell of Nashville, president; W. Litover of Nashville, vice-president, and Leland Humes of Nashville, general manager.

The sixteenth annual report of the New York and New Jersey Telephone company shows that the earnings over operating expenses amounted to \$625,000.87, the gross earnings being \$2,058,477.21. The treasurer shows resources of \$9,048,413.26 and a surplus of \$1,710,342.61, exclusive of \$116,560, reserved for January dividends. Between 1897 and 1898 the gross earnings increased \$268,190 and the operating expenses \$196,656. Last fall the company increased its capital from \$5,000,000 to \$8,000,000 and made a new issue of stock at par to the stockholders amounting to \$1,165,500. The investment in plant amounted to \$885,918, principally in subway construction and putting wires underground.

The annual report of the Hudson River Telephone company shows total gross receipts for the year to be \$377,057.75, expenses \$253,628.80, making a net revenue of \$123,374.95, against \$113,917.22 last year. The capital stock of the company is \$2,000,000; surplus, \$190,338.07; reserve for unearned rentals, \$1,128.00; reserve for outstanding toll tickets, \$5,421.70; bills and accounts payable, \$133,355.37; total, \$2,339,253.74. The officers are: President, James H. Manning of Albany; vice-president, Joseph P. Davis; secretary and auditor, Walter B. Butler; treasurer, James J. Fitzsimmons; general manager, Henry E. Hawley; directors, Joseph P. Davis, New York; James Bigler, Newburg; John G. Myers, Albany; David B. Parker, Randolph; C. Jay French and John E. Hudson, Boston; James H. Manning, Albany, and John E. Adriance, Poughkeepsie.

TELEPHONE LEGISLATION.

The bill taxing telephones has been passed by the Indiana Legislature.

The Delaware Legislature has passed the Donahue bill, regulating telephone tolls for Wilmington, and providing that no company or combination of companies can increase the present tariff.

A bill to regulate telephone charges has been introduced in the California Legislature, in which the charge for one telephone is placed at \$3 per month, and when more than one is used by the same subscriber, to \$2.50 for each instrument, this sum to be in full for all telephone service. Nickel-in-the-slot attachments are prohibited. Connections with places outside the county may be charged for at special rates.

The concurrent resolution passed by the Legislative Assembly of North Dakota relating to the assessment of telephone companies and other quasi-public corporations, known as House bill No. 112, has passed the Senate and will be certified on the official ballot at the next general election. The constitution does not provide for the assessment of property of that nature, and the amendment is for the purpose of remedying that defect.

The Walkerville, Ont., council is considering a measure aimed at the Bell Telephone company. It is claimed by the town electrician that the wires of the telephone company are not sufficiently isolated to protect the buildings in the town, and that, although the company has been repeatedly asked to place its lines in better condition, all of the requests have been ignored. Now it is proposed to pass a new by-law which will compel the company to do so.

The committee on mercantile affairs of the Massachusetts Legislature has listened to the opinions of a number of prominent business men on telephone rates. They all agreed that present rates were excessive. Samuel L. Powers, counsel for the New England Telephone company, contended that competition could regulate rates, but that legislation could not afford relief, and that there was no need of state supervision. He declared that the actual profit of the Bell company in Boston was less than five cents per instrument.

TELEPHONY ABROAD.

The *Chicago Record* correspondent at Gottenburg writes: "The board of manager of the Swedish state telegraph system has asked for an allowance of \$789,000, to be expended during three years for the extension of the telephone system in the kingdom. The government makes about six per cent net profit on the money thus far advanced for such purposes. Still, the state telegraph and telephone lines are managed just as much for the convenience of the people as for profit. The number of interurban telephone conversations during last year exceeded 2,700,000, and the frequency of the telephone call necessitate the building of new lines."

A London correspondent announces that the government asked the House of Commons this week to vote £2,000,000 to enable the Postoffice Department to begin active competition with the National Telephone company, which has a practical monopoly of the business and has carried it on so badly that the service in this country is the worst and dearest in the world. The House of Commons heartily approved the government's resolution, almost the only man to speak against it being Sir James Fergusson. Several bills had been prepared by corporations desiring to engage in telephone service, but these were all laid aside "on account of the announcement made by the financial secretary to the Treasury that the government intends to bring in a telephone bill during the present session."

According to *l'Electricien*, a telephone message counter has been invented by R. Van Kerckhove and will be used for recording and counting the number of telephone messages passed through trunk lines from Brussels, and insuring just charges for service. It is said that the instrument can be manufactured at a very moderate price. On the outside there is a dial with the figures 1 to 5. The needle, when the conversation commences, stands at No. 5, and gradually moves back, indicating how many minutes the speaker still has at his command without extra charge. After 4½ minutes' conversation a stroke on a bell warns the user of the telephone that the time is almost up. An extra charge is made for conversation after the five minutes has elapsed. There is also provided a device by which, during the busiest portions of the day, a change can be made from the five minutes' to a three minutes' conversation.

MANUFACTURERS AND DEALERS.

The Standard Underground Cable company of Pittsburg has received an order from the Japanese government for 16,000 feet of lead-covered telephone cable for an underground system. This is in addition to an order for 40,000 feet of insulated wire for an overhead cable which the company has been working on for some time.

The demand for protection from lightning for telephones and switchboards has become one of considerable importance to telephone exchanges, and those who take the precaution to prepare for the season of disaster to telephone properties will be the ones who will escape not only an enormous expense, resulting from burnouts, but also the exasperating annoyances and inconvenience of not being able to render proper service to their patrons. In this connection announcement is made that the Western Electrical Supply company of St. Louis has a most elaborate assortment of Maxstadt fuses and carbon lightning arresters of every design, such as are at the present time in demand. It is constantly increasing its supply of this class of material, and is always able to take care of its customers in the most satisfactory manner.

TELEPHONE EQUIPMENT.

The Radford Telephone company of Radford, Va., wants to buy telephones, wire and other supplies for a system of 50 subscribers.

David Pruett, secretary of the Winchester and Lexington Telephone company of Pinegrove, Ky., wants a number of toll switchboards to be used in connection with an exchange to operate from four to 12 drops; also at junction points to operate from two to six connections.

NEW COMPANIES.

J. F. Gemelich, J. S. Sanfert and E. W. Chilton are among the incorporators of the Boonville, Mo., Telephone company.

Corning, Ia., has organized a telephone company, with Hon. Bury Brown, Attorney Meyerhoff and Editor Junkin as directors.

Col. H. P. Farrow and associates will organize a company for the establishment of a telephone system from Dahlonga to Gainesville in Georgia.

The Alma, Mich., Telephone company has been incorporated, with a capital of \$25,000, by G. S. Aldrich of St. Louis and F. C. Brown of Alma.

The incorporation of the Raton Telephone company with capital stock at \$10,000 is reported from Albuquerque, N. M. J. L. and C. F. Laub are the promoters.

The City Council of Wilmington, Del., has granted a franchise to the Wilmington Home Telephone company, composed of Miletus Garner, S. R. Mitchell,

C. R. Fisher, L. J. Walker and S. G. Smith, for the building of a new telephone system. The capital stock is \$15,000.

The Radford Telephone company of Radford, Va., has been incorporated with an authorized capital of \$5,000 by D. D. Hull, B. Laughon, George M. Holstein and B. F. Garnett.

A commission for a charter was issued on March 4th to the Orangeburg (S. C.) Telephone company. The incorporators are W. Hampton Dukes, W. C. Wolf and A. C. Andrews.

A telephone company has been organized at Geneva, N. Y., with R. H. Smith as president, John M. Budlong vice-president, Willard Sterling secretary and Dr. S. S. Richards treasurer, to construct a line to Schuyler.

The Lake Park and Ulm Telephone company, to operate an exchange in Lake Park, near St. Paul, has been incorporated by R. T. Gilmore, John Nelson, T. C. Hawley and others of Lake Park.

The People's Telephone company of Luzerne County, Pa., announces that it will have its lines in operation from Scranton to Hazleton by May 15th. The officers are Abram Nesbitt, president; Irvin A. Secarns, vice-president; Samuel C. Wayland, manager; John W. Hollenback, W. A. Lathrop, C. A. Stegmaier of Wilkesbarre and A. Markle of Hazleton, directors.

Wilmington, O., has granted the Home Telephone company a franchise, and it will actively compete with the Central Union company. The new corporation promises telephones to business places at \$1.50 a month and to residences at \$1. The capital stock of the company is \$15,000, and the incorporators are Milesus Garner, S. R. Mitchell, L. J. Walker, C. R. Fisher and S. G. Smith.

Articles of association of a new telephone company for Meriden, Conn., have been filed. The new company is the Connecticut Automatic Telephone Exchange company, which has the exclusive right in Connecticut of the Strowger automatic telephone-exchange system. The capital stock of the new company is \$250,000, and the stockholders are Charles W. Royce, Edward L. Allen and Stephen C. Wolcott of Newton Center, Mass.; William G. Nash and Ira B. Cushing of Brookline, Mass.

EXTENSIONS AND IMPROVEMENTS.

A new telephone service is proposed at Puebla, Mexico.

The Oregon Telephone and Telegraph company will build a line between Salem and Albany.

The Massachusetts Telephone company has applied to the council of Beverly, Mass., for a franchise.

The Nelson and Vernon Telephone company has decided to install a local system in Greenwood, B. C.

Agents have closed a contract for a telephone line from Fullerton to La Hebra Valley.

It is reported that the telephone line from Port Orford, Ore., will be completed through to Wedderburn.

Telephone exchanges are to be established at Trail, Rossland, Cascade, Grand Forks and Republic, according to the Spokane (Wash.) *Chronicle*.

Rust Brothers of San Angelo, Texas, will build a telephone line from San Angelo to Robert Lee, a distance of 35 miles. They will also extend the Sterling City line to Colorado City.

The city of Earlville and La Salle County have granted franchises to the Lee County Telephone company of Dixon, Ill., which proposes to extend its lines as soon as the weather will permit.

The Columbia Telephone-telegraph company of Rossland has closed a contract with Messrs. Davey and Donald of Grand Forks for the construction and equipment of a telephone-telegraph line from Trail to Cascade, Wash.

The county of Jo Daviess, Ill., and the incorporated villages of Stockton, Nora, Warren and Apple River have granted franchises to L. D. Pitcher of Dixon and his associates for a county telephone system to connect with Carroll and other counties in the northwestern part of the state. Work will be commenced at once.

Colonel E. K. Baker, superintendent of the South Texas division of the Southwestern Telegraph and Telephone company, has closed a deal for the erection of a relay station at Houston. Work will be commenced immediately, and it is hoped to have the station in active operation in a short time. Some of the wire needed has already been strung. The object of the relay station is to prevent interference with the long-distance lines of the company in case of a fire or other accident which might render the wires of the local exchange useless. Under the present arrangement, Galveston would be entirely cut off from telephonic communication with all parts of the state and with all points to which the long-distance wires extend in case such an accident occurred in Houston. In connection with the new station, a belt line around the city will be erected, and, no matter what conditions exist at the up-town exchange, the company will be enabled to operate its long-distance wires without trouble, the operators at the relay station being given access over the belt line to all of the numerous connections.

Patent Systems of the United States and Foreign Countries Compared.

[Continued from page 157.]

frequently results in the issuance of a patent which fails to secure to the inventor his just rights. In England the patent is granted for that to which the inventor considers himself entitled, and the patent when litigated is usually sustained for so much of the invention as appears from the evidence to be novel, the patent being thus more or less elastic in its nature, broadening or narrowing to meet the true measure of the inventor's real invention.

While the English system is advantageous in this particular, the advantage is greatly overborne by the fact that the issuance of a patent is not a prima facie proof of novelty or validity, while in the United States, where examination is made, the inventor when he receives his patent knows the scope of his invention and is able to judge of its validity. In the English system the inventor receives no more assistance in this regard than though the patent had not been granted. Nor is the liability of receiving too narrow claims by the American system the fault of the system. The inventor or his attorney should present claims commensurate with the true scope of the invention in view of the prior art as disclosed by the examiner's search, and if the examiner is considered obstinate in his refusal to allow the same, the inventor should avail himself of his right of appeal. Where an evident mistake has been made by the inventor or his attorney through accident or inadvertence the mistake can be corrected by reissue if timely application therefor is made. The best evidence of the efficiency and advantage of the examining system is that the foreign countries are one by one adopting this practice; and, moreover, inventors, foreign as well as domestic, avail themselves of the efficient corps of examiners in the United States Patent Office to determine the real scope of their inventions and then apply for patents in the foreign countries on the inventions as developed in the United States Patent Office.

Considering the third of the above-mentioned differences, the foreign countries do not permit the knowledge or use of the invention to become public within their borders prior to the application for the patent. Such prior knowledge or use does not preclude the grant of the patent, but the patent when granted is invalid, and if contested, this fact being proven will prevent recovery for infringement. The United States wisely provides a probationary period of two years within which the inventor may use his invention in public and introduce it into commercial use, if he sees fit, to try the demand and determine whether or not it is successful mechanically and commercially. He may then go into the Patent Office and secure a patent on his invention. This provision is not only an assistance to the inventor but is a benefit to the public, since it does not compel the inventor to rush into the Patent Office with a crude idea, but encourages him to wait until he has demonstrated the practicability of his invention, when by disclosing such a structure in his letters-patent he gives something of real value to the public.

As to the fourth difference above referred to, the foreign countries with the exception of Great Britain usually provide that the invention shall be worked or put into use in the country within a certain period after the application is filed, usually from one to three years. This is a hardship to meritorious inventors, since it is often difficult for a poor man to enlist capital in so short a time to place the invention in a marketable condition before the public, and fails to reach the parties at whom it is apparently aimed. Parties who are placing an inferior article on the market frequently make improvements which would greatly benefit the public if placed on the market, but such devices when patented and thus withdrawn from the use of the public generally are shelved, since there is more profit in the sale of the inferior articles. These provisions contemplate the forfeiture of the patent for failure to work such inventions; but the intent of the law is readily circumvented by the practicing of the invention on a small scale at stated intervals to comply with the requirements of the law. Such provisions, therefore, while apparently failing to operate effectively where they would serve to advantage, impose a very material obstacle in the path of the struggling and usually meritorious poor inventor.

Considering the fifth difference, relating to importation, the United States places no restriction upon the enjoyment of the invention in this particular, and a foreigner after taking out a patent in this country need not manufacture here, but can manufacture abroad and import the articles into this country to supply the demand here. This, of course, is an economic disadvantage to this country and is a derogation of the rights secured to home manufacturers by a protective tariff, but is an illustration of the respect paid to patent property.

Referring to the sixth difference referred to, the foreign countries usually provide for a graduated tax payable yearly throughout the life of the patent and increasing from year to year, so that the patent becomes an increased burden as its life is prolonged. The spirit of this provision is to spur the inventor to reap a reward from the invention as soon as possible by putting the same on the market and thereby giving the public the benefit thereof, and to discourage the prolongation of the life of the patent when the invention is not put into public use or has

not proven remunerative. This is another of the provisions of foreign countries tending to discourage the inventor by placing obstacles in his path. To wealthy parties the tax is not a burden, and while the real injury to the public arises from the withholding of important inventions from the public while being supplied with inferior goods in which there is more profit to the maker, these taxes do not attack this evil, as is their evident intent, since such parties are abundantly able to pay the consideration necessary for withholding the invention from the public, and the whole burden of the provision falls upon the poor inventor who, in addition to the difficulty of enlisting capital to exploit his invention, finds himself in constant danger of losing all of his rights by failure to raise the necessary amount to pay the frequently recurring taxes. The patent system is the fortune field of the poor inventor, and while a heavy tax upon unused inventions would undoubtedly be an advantageous provision if discriminatingly applied, it seems that the only effect of a general provision to this effect is to work a hardship upon the very inventors who should rather be given assistance.

Adverting to the seventh distinction above mentioned, we find that some of the countries, particularly Germany and Canada, provide for a compulsory license where the inventor or owner of the patent does not or is unable to supply the market. In Germany any party wishing to utilize a patented invention which is not being put upon the market to supply the demand or a probable demand can apply to the government for a compulsory license, which, in proper cases, is granted by the government after the giving of proper guarantees and security for the payment of royalties. This is apparently a good provision, and might be applied to advantage in this country.

As to the eighth difference mentioned, the practice of the foreign countries is to limit the term of the monopoly from the date of the application, whereas in the United States the term begins to run from the date of the grant of the patent. Where no examination as to novelty is made the practice of the foreign countries is undoubtedly a proper one. Where, as in the United States, examination as to novelty is made, often necessitating appeals and long delay, such a provision would be manifestly unjust, since the course of appeal frequently occupies a number of years, while several years is not infrequent in the absence of an appeal, due to the overworked condition of the examining corps. Then, too, several applications, claiming the same invention, necessitate the declaration of an interference to determine who is the first inventor, and this process, subject to many appeals, consumes considerable time, so that if the term were to date from the filing of the application a considerable period of the term would often elapse before the commencement of the monopoly, and this, frequently, without fault on the part of the applicant.

But, on the other hand, the United States practice often results in great injustice to the public, by permitting an application to lie in the Patent Office for a long period of years, while another and former patent is securing a monopoly, to issue at last just as the earlier patent is about to expire, thus securing an increased monopoly for practically the life of a new patent. Such an instance is the now famous Berliner case, the injurious effect of which upon the public and upon our patent system has not as yet been determined. Since it is apparent that it would be unjust to the inventor, on the one hand, to adopt the foreign practice and limit the term from the date of application, and since the present practice is, on the other hand, unjust to the public, it has been proposed to adopt a mean between the two and provide for the running of the term, as at present, from the grant of the patent, but to provide that in no case shall the monopoly extend beyond a period of, say, 20 years from the filing date of the application. This would give three years for the prosecution of the application, and would seem to solve the present difficulty.

The ninth difference is one which arises from a law which went into effect in the United States the first day of January, 1898, and which provides, in effect, that the life of the United States patent shall not be affected by the previous expiration of a foreign patent for the same invention, whereas prior to that date in the United States, as well as at present in many foreign countries, the foreign patent first to expire determines the life of the domestic patent. The spirit of this provision seemed to be that since the monopoly is in the nature of a tax on the public, the removal of the tax in a foreign country by the expiration of the patent there would subject this country to a disadvantage, and that in consequence the tax should be removed here at the time it is removed from the first of the foreign countries. But this would hold good only in case patents were taken out in all the foreign countries, which is practically never the case, so that the argument is apparently not sound, and after wondering for some time what was the real advantage of the provision, and concluding that it really had no reason for existing, Congress repealed this restriction to the proper enjoyment of the monopoly by the inventor.

It is thought that it will appear from the above that the system of the United States is the most liberal to the inventor in that it not only assists him to determine the scope of his invention, but also removes all checks from his enjoyment of the monopoly. While it is apparent that in our system some

objections and abuses may arise, they are not due to the general provisions of the system, but rather to the lack of specific provisions for checking the particular abuses, and these will, it is believed, be in time remedied, but not by radical changes or the adoption of the cumbersome provisions of foreign systems, although we may derive suggestions from their practice. As to the practical effect of the American system, a comparison of the patents granted by the United States and foreign countries shows

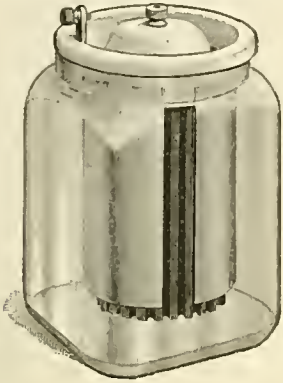
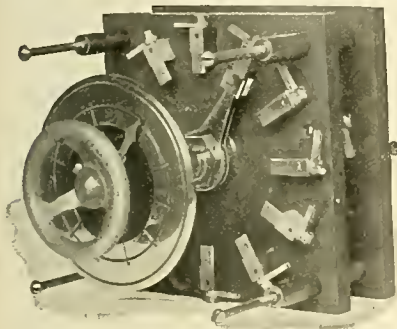


FIG. 1. HERCULES BATTERY.

that up to the year 1898 the United States had granted 626,327 patents, France 297,166, Great Britain 265,870, Belgium 146,772, Germany 118,694, Austria-Hungary 82,933 and Canada 65,489. The United States thus stands head and shoulders above all the other nations, having granted more than any two of the other countries.

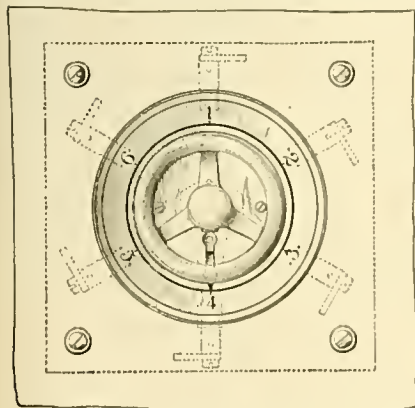
During 1898 there were over 36,000 applications for patents filed in the United States, while in Great Britain there were about 30,000 applications filed. Practically, all of the applications in Great Britain



FIGS. 1 AND 4. WESTERN ELECTRIC INSTRUMENT SWITCH.

mature into patents, many of which are invalid by virtue of previous patenting, since no examination as to novelty is made. During the year 1898, 22,207 patents were issued in the United States, after examination, and at the end of the year there were 6,824 applications allowed and awaiting the payment of the final fees, while 4,363 applications had been allowed, but had been forfeited for the non-payment of the final fees.

Just how much of the great activity of American inventors is to be attributed to the encouragements offered by our liberal patent system and how much mechanically determined, but it is safe to say that the is to be attributed to the inherent inventive faculty of the American people cannot, of course, be mathe-



FIGS. 2 AND 3. WESTERN ELECTRIC INSTRUMENT SWITCH.

rewards offered by our system have been the fundamental cause which has produced, as a result, a people, every member of which is a born inventor and is accustomed to the practice of mechanical ingenuity from early childhood.

Seymour, Iowa, will vote on the proposition to issue bonds for electric lighting on March 27th.

Hercules Battery.

In placing the Hercules battery cell (Fig. 1) on the market, the Peru Electric Manufacturing company of Peru, Ind., aimed to produce a high-grade battery at a moderate cost, and it feels confident that all users will agree that the object has been accomplished.

This cell consists of a fluted cylinder (Fig. 2) made of selected carbon, filled with a depolarizing compound. The zinc (Fig. 3) is cylindrical in form and made of the best rolled zinc and thoroughly amalgamated. The cover is of porcelain and forms a perfect lid for the jar, preventing evaporation or the climbing of salts.

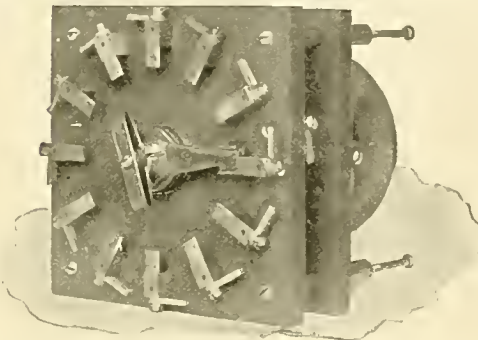
The manufacturer recommends the Hercules as being one of the best batteries on the market, and says that it is without an equal for gas-lighting and gas-engine work, and in fact for all open-circuit work where the conditions are most severe. The data given are: Electromotive force, 1.47 volts; internal resistances, .11 ohm; current on short-circuit, about 13.4 amperes.

Western Electric Instrument Switch.

The cuts show a new switch designed and placed on the market by the Western Electric company to meet the demand for a substantial voltmeter and ammeter switch. Fig. 1 shows a front view of the switch unmounted. Fig. 2 is also a front view, but showing the device mounted on the switchboard. Fig. 3 is a sectional view through the board, and Fig. 4 a rear view of the unmounted switch.

The contact points of opposite polarity are mounted on separate slabs of white marble, which are fastened on the back of the switchboard. The switch is controlled from the face of the board by a neat hand-wheel and index plate. It has a positive knife-switch contact capable of carrying 15 amperes. This feature specially adapts it for use as a multiple shunt ammeter switch, as uniformly low-resistance contact is necessary for accurate results.

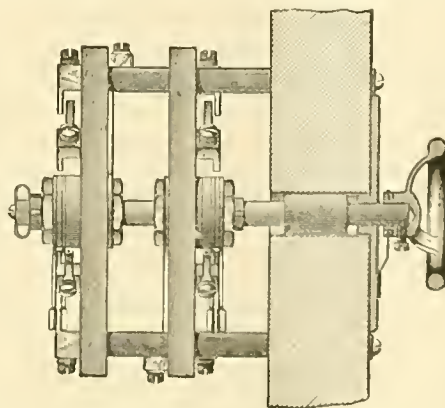
The hand-wheel and index plate are regularly fur-



nished with a polished copper finish. All switches are provided with removable collars on the screws which hold them to the switchboard, so that they may be mounted on marble or slate, one, 1 1/4, 1 1/2 or 2 inches thick. The space occupied on the back of the switchboard is 6 1/2 by 6 1/2 inches, and the switch projects six inches behind the rear surface of the board. Switches are furnished for from two to 12 circuits, inclusive.

Varley Spark Coil.

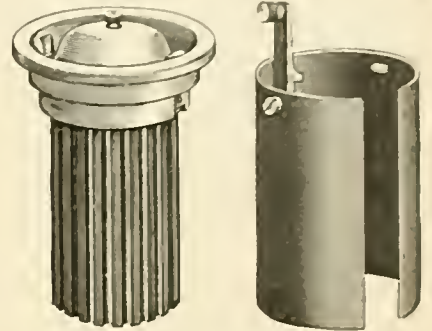
The Varley Duplex Magnet company of Jersey City, N. J., has recently placed on the market, for ig-



nitiation purposes, the special Ruhmkorff coil herewith illustrated. This coil is built to give a spark from one inch to 1 1/2 inches in length. It is especially adapted for gas and gasoline-engine work. The company states that it has made a special study of the wants of gas-engine builders and believes that its new igniting apparatus is far superior to the imported coils which are largely used in the United States for this purpose.

Bates Ceiling Fan.

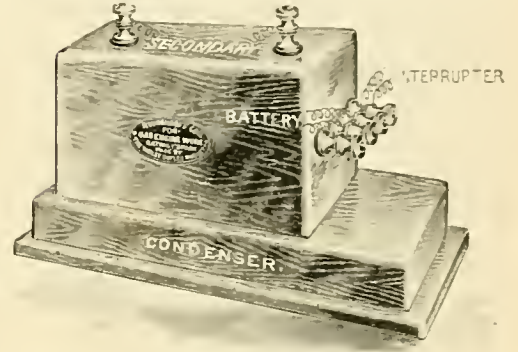
The accompanying illustration shows one of the many new designs of electric fans brought out by the firm of D. L. Bates & Bro., Dayton, Ohio. The mechanical arrangement of the fan is such that there is but a single bearing running in oil. The bearing extends the entire length of the motor, making it impossible to get out of line and obviating all danger of the armature striking the pole piece. The fan is also provided with a switch which is completely incased in the housing at the bottom of the motor



FIGS. 2 AND 3. HERCULES BATTERY.

casing, but which is accessible for turning the current off or on.

While the illustration shows the fan with switch and with electric-light attachments, these may be dispensed with if desired. The general external finish of these fans is nickel, oxidized copper or polished brass, but they are also furnished in the black-enamel finish with polished brass trimmings. The same firm has also placed on the market a 12-inch and a 16-inch desk fan, also an adjustable bracket fan for 110, 220 or 500 volts direct current, the

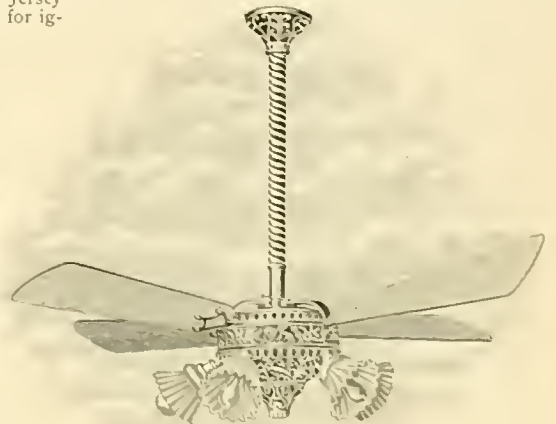


VARLEY SPARK COIL.

fields of which are made of forged steel. These fans are guaranteed to run on less current than any other fan of corresponding size. The firm also manufactures alternating-current ceiling fans and water-motor buzz fans, which give excellent satisfaction.

Municipal Electricians at Wilmington.

Indications are that the next convention of the National Association of Municipal Electricians in Wilmington, Del., in the week beginning September 14th, will be a pronounced success. President J. W. Aydon of the association has secured Pyle's Cycle



BATES CEILING FAN.

Academy for an exhibition hall, and free space will be given to exhibitors. The Board of Trade of Wilmington has appointed a committee of five to interest the business men of Delaware in the meeting. The association has now members representing 110 cities in the United States.

B. Perry and B. H. Dyer are applicants for an electric-light and power franchise in Santa Ana, Cal.

The Motor Vehicle in Commercial Operation.¹

By G. HERBERT CONDUCT.

Having covered over 250,000 miles of actual and commercial service, the electric vehicle in New York has proved itself no longer a toy to be played with by the wealthy, but a practical thing, which is to come to the aid of the dwellers in our great cities, who are anxiously beholding the vast congestion of traffic in the streets and wondering what is to become of it in the future. The modern Rip Van Winkle goes to sleep for much less than 20 years and when he awakes what does he behold? The streets of the city are clean; no rails cut up the smooth surface; no horse or any other beast is here—they are prohibited within the city limits. The pedestrian wends his quiet way along the sidewalks elevated to the second story with bridges over the street, while below the agile electric darts at good speed back and forth, on its noiseless, easy-riding pneumatic tires, carrying all manner of humanity and its goods and chattels, and delivering them, not at the curbstone, but at the doorstep. The elevated train, the cable and the trolley car have disappeared, but far below the surface glides the electric local and express in light and well-ventilated subways. The streets, made wider by the absence of sidewalks on the same level, allow a free movement of vehicular traffic, and the second-story stores are free from the dirt and turmoil now so overpowering.

The men who organized the company operating the electric-vehicle station in New York looked at the crude and inefficient apparatus which was at their disposal and saw in it the possibilities of a great industry. They decided to put sufficient capital at work to develop their ideas, and the present success of electric cabs bears abundant testimony to the wisdom of their decision. This station was equipped with the most approved battery-handling apparatus then obtainable, and no expense was saved in procuring the very latest improvements in all of the various parts which go to make up a vehicle which could be depended on to do the work required of it. The supply is so absurdly inadequate to fill the demand that operation is carried forward under great disadvantages, considering the many component parts that are altogether incomplete and experimental. It has been impossible to make accurate tests of the efficiencies of motors, batteries, gearing, bearings, etc., although data are now being obtained. There is still much to be desired, and in future equipment most material improvements will be made.

Outside of the consideration of large weight in proportion to power delivered, the battery has been giving excellent service. Up to the present time there has been practically no expense for maintenance, and the old-time troubles of buckling, short-circuiting, sulphating, disintegrating are as yet entirely absent.

The tire situation is at present the absorbing subject of our day thoughts and night dreams. Were the streets in this great metropolis paved in an up-to-date manner, there would be comparatively little cause for anxiety on this score, but with the antiquated and despicable cobble the case is far different. Over 20 separate and distinct types of tires have been tried or are to be tried in the near future, and others will probably follow. Solid, single and double-tube pneumatic, cushion, clincher, sectional, protected and unprotected have all had or are to have a trial. Their faults are many, their virtues few, and we are still on the search. We have heard of some eminent authorities in the motor-vehicle field who say that the solid is the only tire. They are rendering judgment without full knowledge of the facts and from a purely local standpoint. They are evidently not acquainted with the streets of Manhattan. A very satisfactory combination for broughams is that of rear pneumatics and front solids.

The wheels also require most serious consideration. The severe strains unavoidable in crossing railroad tracks and other inequalities and running up against curbstones speedily put out of service even the most substantial constructions. Everything from the light and airy bicycle-wheel construction to the dishpan wheels, now so familiar on our streets, have been tried, and still there are more to follow. I mention these few items to indicate some of the most important and particular directions in which the work is progressing.

Another Storage-battery Report.

When new papers have for some time asserted that the Electric Storage Battery company of Philadelphia had been absorbed by a Whitney syndicate, the story being that the particular absorbing company was the New York Gas and Electric Light, Heat and Power company, with its \$36,000,000 capital. But according to the New York correspondent of the *Country Record*, there is a larger scheme afoot. The *Record's* dispatch is dated March 14th and is as follows: "W. C. Whitney is the head and shoulders of a syndicate trust which has consolidated with the storage-battery companies and will control the electric cabs of New York, build thousands of others, install electric delivery-wagon lines and omnibus routes, run the Holland submarine torpedo boat, launch electric launches and ferry boats. The capital is \$100,000,000."

¹ Address: 1144 Broadway, prepared for the New York Electrical Society last month.

Development of Niagara Power on the Canadian Side.

[Special correspondence of the WESTERN ELECTRICIAN.]

The question of the development of the power on the Canadian side at Niagara Falls has reached that stage of public interest that on Friday, March 3d, the people of Niagara Falls, Ont., and vicinity ran a special excursion train to Toronto, Ont., carrying between 300 and 400 persons, who went to make a demonstration before the Ontario Legislature that day at the time a resolution on the power-development question was to be brought up by W. M. German, the member from Welland, in which the Niagara territory is located. All members of the party wore badges bearing the inscription, "Canada no place for monopolies." These words referred to the exclusive agreement between the Ontario government and the Canadian Niagara Power company, in regard to the development of power in Victoria Park on the Canadian side of the Niagara River. By section 10 of that agreement it is provided that the company shall have, by November 1, 1898, completed water connections for 25,000 horse power, and 10,000 horse power actually developed. In November last the courts decided that the company has until November 1, 1899, to do this work. By clause 13 it is provided that if the company shall neglect for one year effectually to generate electricity or pneumatic power its license shall be forfeited. Up to this writing the Canadian Niagara Power company has not taken any steps in Victoria Park to lead the people to believe that it will try to have the above-mentioned water connections made and power developed by November 1st next, and the opposition to the company alleges that it will be an utter impossibility for it to live up to the agreement mentioned.

Mr. German's resolution was as follows:

Resolved, That in the opinion of this House the sole and exclusive right to the use of the waters of the Niagara River within the limits of the Queen Victoria Niagara Falls Park, under the agreement set out in chapter 8 of 55 Victoria (Ontario), between the commissioners for the said park and Messrs. Shaw, Steetsen and Rankine, or the Canadian Niagara Power company, as provided by section 9 of the said agreement, should be forfeited and terminated immediately upon default by the company in complying with sections 10 and 13 of the said agreement, and that no performance of the work, expenditure of money or letting of contracts in part performance of the work to be done in generating electric power under said sections should be considered to save such forfeiture.

And this House is further of opinion that all necessary steps should be taken to bring about at the earliest date the largest possible development of Niagara power.

The resolution was adopted.

Has a Smoker Inalienable Rights?

John M. Wallace of Brooklyn says that he is going to get an opinion from the Court of Appeals, if necessary, in order to set at rest the question of whether or not he has a right to smoke on the rear platform of a Brooklyn trolley car.

In the Myrtle avenue court Wallace complained against John Arkwright, a conductor of the Gates avenue trolley line, whom he charged with assaulting him. On the night of February 17th, according to the report in the *New York Tribune*, Wallace said that he was on the rear of the defendant's car, smoking a cigarette. Arkwright requested him to stop, and referred to the rule of the company prohibiting smoking. Arkwright offered the smoker his nickel back and told him to get off the car. Wallace dared the conductor to put him off the car. Arkwright told him he didn't want to have any trouble, but if he allowed smoking on the car he was likely to lose three days' pay if it should be reported to the company.

The discussion became warmer, and Arkwright cut the argument short by knocking the cigarette out of Wallace's mouth. This act Wallace resented, and the men engaged in a scuffle. Wallace alleges that the conductor kicked him in the ribs. Magistrate Teale advised Wallace to drop the case, as the company had the right to make rules of its own about smoking on its cars.

Wallace said that he would never give in. The magistrate dismissed the charge against Arkwright, and Wallace left the courtroom just as angry as ever.

Postal and Western Union Dispute Over Cable Rights to Cuba.

The attorney-general of the United States gave a hearing recently on the question of the right of the Commercial Cable company of Cuba, a corporation organized on February 15, 1899, in New Jersey, by officers of the Postal Telegraph-cable company, to land and operate a submarine cable between the United States and Cuba. This right is contested by the International Ocean Telegraph company, now under management of the Western Union Telegraph company. It was contended on behalf of the International Ocean Telegraph company that by the specific terms of a royal decree issued by the Spanish government in 1866 it acquired the exclusive right and privilege for the term of 40 years to land a cable in Cuba, to be operated between that island and the United States. It was argued further by the terms of the treaty of peace between this country and Spain the United States bound itself to respect all private rights of ownership of property of whatever character in the island, and disavowed any intention permanently to exercise sovereignty over it, and hence it had no authority to abrogate the decree or interfere with the full enjoyment of the company's rights under its concession. On behalf of the Commercial

company it was said that the original franchise from Spain had been secured through misrepresentation and fraud, and also that the continuance of the monopoly was contrary to the public policy of the United States. It was also contended that under its general authority over conquered territory the United States had a right to inquire into and abrogate such concessions as were found to be subversive of the rights of others and against public policy. A copy of "The Official Gazette," containing the decree of 1866, was filed with the attorney-general. This copy, it was said, showed that the concession was obtained through false representation that the United States had also granted an exclusive monopoly for 40 years. Counsel for the International Ocean company contended that the allegation of fraud was not sustained, as the royal order of 1889 fully confirmed the concession of 1866 for the full term of 40 years, and says in specific terms that the franchise granted by the United States was for 14 years. Therefore there could have been no misunderstanding as to the length of time it was to remain in force. The attorney-general took the matter under advisement.

Pan-American Exposition.

[From the Niagara Falls correspondent of the WESTERN ELECTRICIAN.]

The plans for the Pan-American Exposition, which is to be held near Buffalo in 1901, are gradually assuming definite shape. Congress has appropriated \$500,000 and the Legislature of the state of New York \$300,000 for exhibits, and other states of the Union have been called on to take action looking to proper representation at the great event. The incorporators have met and elected a board of 25 prominent Buffalonians as directors, their names being as follows: Mayor Conrad Diehl, C. W. Goodyear, Capt. J. T. Jones, George L. Williams, J. J. Albright, Major T. W. Symons, W. Caryl Ely, John G. Milburn, Frank B. Baird, William Hengerer, George Bleistein, H. M. Gerrans, E. G. S. Miller, J. N. Scatterd, George K. Birge, W. H. Hotchkiss, J. M. Brinker, George Urban, Jr., John B. Weber, Harry Hamlin, Carlton Sprague, Henry J. Pierce, F. C. M. Lantz, H. P. Bissell, Robert F. Schelling. One of these, J. J. Albright, announces that he does not care to be on the board.

The directors have selected rooms in the Ellicott Square building, Main street, for permanent headquarters. Edwin Fleming has been elected secretary and George L. Williams treasurer of the board. A president has not yet been elected. It may be that this office will be in the main honorary, and that the hard work of the exposition head will fall upon the head of the executive committee. A director-general has not been selected. A committee on by-laws has been appointed and is now at work. The by-laws will tell the scope of the exposition and the various offices to be filled. It is already known with reasonable certainty that outside of the officers above referred to there will be an auditor-general, an executive committee of seven, a finance committee of the same number and similar committees on grounds, publicity and promotion, foreign affairs and exhibits, and on tariffs and transportation. The executive committee will be the hard-working committee, and the members will have to give about all their time to the exposition matters. The president of the exposition will be expected to receive the distinguished guests and make the speeches. There is talk of increasing the capital stock of the company to \$2,500,000. The present capital stock is \$1,000,000. The grand total of subscriptions to date is \$1,353,980, and the total number of subscribers is 11,976.

All who seek for positions or concessions should wait until the various bureaus are perfected, for until then no one will be in position to give information or make contracts.

Power and Light Exposition at Austin.

In connection with the annual meeting of the Southwestern Gas, Electric and Street-railway association at Austin, Texas, an exposition of apparatus used for lighting and power will be held from April 19th to May 1st. A large building will be constructed, and power for exhibits will be supplied without cost. Manufacturers are promised liberal treatment and are urged to exhibit. There is a large water-power electrical plant at Austin, and for this reason the city is thought to furnish a particularly appropriate site for an exhibition of power-transmitting machinery. George A. Hill, the secretary of the Austin Commercial Club, or E. L. Wells, Jr., the secretary of the association mentioned above, can supply further information.

Information Wanted.

[From the *American Machinist*.]

The autotruck is to transform the city [of New York]. We have a great boom on for compressed air. There is an American Air Power company with a capital of \$7,000,000, an International Air Power company with a capital also of \$7,000,000, a New York Autotruck company, \$10,000,000, and a Chicago Autotruck company, \$10,000,000. Such eminent engineers as Richard Croker and Joseph Leiter are operating the machinery, stock is selling, and its "value" is advancing. Some of it has been quoted above 70; but where is the truck, and what can it do? Where is the first truck, and where is there any promising record of its practical performance?

There is a truck which has hauled castings around a factory yard in Worcester, Mass., and that, we are given to understand, is all that there is as yet to show. Two factories are ready to rush out the trucks, but are they yet invented? We are not here implying that they are not; but the question would seem to be a proper one. When stock is for sale the stock buyers should know what they are buying. Do they know in the present case?

CORRESPONDENCE.

New York Notes.

NEW YORK, March 13.—Tammany's "holy war" on the Manhattan company has, from all present appearance, passed into history, without any result whatever. At last Tuesday's meeting of the Municipal Assembly the council recalled from the mayor the resolution requiring the Manhattan Railway company to run cars on all its tracks on a five-minute headway at all hours of the day. This is the procedure suggested by the mayor and adopted by the council. It is the same as that by which the drip-pan ordinance was disposed of the week before and sent to a committee of the Board of Aldermen, where it still remains. The resolution requesting the mayor to recall the ordinance was moved by Vice-president Oakley, who then moved that it be referred to the railroad committee. There were no explanations and no discussion, and the resolution was quietly referred. Mr. Baker, the new electrical superintendent of the Manhattan company, is now at work. He says that the company will use the third-rail system. The work of installing the system, building a power house and constructing the motor cars to be used on the road will be begun as soon as possible.

The City Lighting company of New York city has been incorporated with a capital of \$1,000,000 to furnish electricity for light, heat and power purposes, to light public streets and dwellings, and to manufacture and supply both illuminating and fuel gas. The company is to operate in New York, Kings, Queens, Richmond and Westchester counties. The directors are John M. Ryan of New York city and Frank L. Hearn and John S. Griggs, Jr., of Brooklyn.

Mr. W. J. Johnston, the late owner of the *Electrical World*, is enjoying a trip to the West Indies after his release from the cares of electrical journalism. Before his departure a number of friends and acquaintances presented him a silver loving-cup. It is announced that the Johnston electrical directory has been sold to Mr. E. L. Powers.

It is expected that before the close of the month the two big trolley systems of Brooklyn (Rapid Transit and Nassau) will be operated as one. Some radical changes in the management are contemplated, which will materially reduce the operating expenses. All the Nassau cars will be painted the same color as those of the other road.

Public notice was given on Saturday by the New York and Staten Island Electric company that the company might discontinue the lighting of the streets of Richmond borough, because it had not been paid by the city of New York for the service already rendered. In his announcement, General Manager Swinerton says: "The New York and Staten Island Electric company wishes the public to know that since its organization and the assumption of the public street lighting of the entire borough of Richmond, now over one and a half years, it has not received one cent of payment for the service; that in addition to lighting streets it has in the past done more free lighting of churches, public buildings, and even private property, than any such company can stand and remain solvent, and to have the borough refuse to pay for its public lighting inflicts upon the stockholders of the company the last blow."

M. S.

PERSONAL.

R. H. Bouslog, the secretary and treasurer of the Peru (Ind.) Electric Manufacturing company, was in Chicago a few days ago.

Mr. Patrick Nally, the father of Mr. E. J. Nally, assistant general superintendent of the Postal Telegraph-cable company, died at the latter's residence in Chicago last week at the ripe age of 82 years.

At last week's meeting of the New York Electrical society the following-named members were elected: Albert C. Jahl, T. E. Crossman, W. H. Lawrence, C. J. Field, George M. Warner, George C. Anthon, Charles Klein.

The new manager of the Western Union office at Milwaukee, M. W. Hamblin, has been in the service of his company since 1877. He has been manager of the offices at Janesville, Wis., Bloomington, Ill., and Davenport, Ia.

George Westinghouse presented to Union College, Schenectady, N. Y., some time ago, a 20 horse power gas engine of the latest type. It is now set up in the engine room of North College, and furnishes power for illuminating the whole college.

Samuel W. Schwab, head of the time department in the Edison works in West Orange, N. J., died at his home in Orange on Saturday last. He was born in New York in 1873, and educated in the public schools. He entered the employment of the Edison Manufacturing company in 1886, as an office boy,

and gradually rose till he became the head of the time department of all the works. He married Miss Martha Kruse in 1892, and she survives him, with two children.

ELECTRICAL SECURITIES.

The Commercial Cable company has declared a quarterly dividend of 1 1/4 per cent., payable April 1st.

The Columbus street railroad reports gross earnings for February of \$52,697, an increase of \$4,546 as compared with the same month of last year, and net \$28,831, an increase of \$4,018. For the two months ended February 28th the gross earnings were \$110,688, an increase of \$8,249 as compared with the corresponding period of last year, and net \$60,627, an increase of \$6,717.

First-mortgage five per cent. gold bonds of the Cincinnati Edison Electric company are placed on the market by N. W. Harris & Co. of Chicago. The issue is \$1,000,000, and the banking firm states that "prior to our purchase of the bonds, the plant and business of the company were carefully investigated for us by Samuel Insull, Esq., president of the Chicago Edison company, who states that the property represents an actual cash investment of approximately \$2,027,000 (total amount of bonds outstanding only \$1,100,000), and that the large fireproof central station recently completed by the company is one of the most modern and best equipped in the United States."

Fifty-year five per cent. first-mortgage gold bonds of the Trenton (N. J.) Gas and Electric company to the amount of \$1,500,000 are offered for sale by Redmond, Kerr & Co. of New York. They are dated March 1, 1899. The company is a consolidation of the Trenton Gas Light company, the City Gas Light company, Trenton Light and Power company, People's Electric Light company, Trenton Electric Light and Power company and Edison Electric Light and Power company. In addition it owns the entire capital stock of the People's Gas Improvement company and the Delaware River Improvement company, thereby controlling either through actual ownership or ownership of stock all of the gas and electric-light plants in the city and suburbs of Trenton, N. J.

Alexander Brown & Sons of Baltimore offer \$18,000,000 of first-mortgage, four per cent., 50-year gold bonds of the United Railways and Electric company of Baltimore at 102 1/2 and accrued interest from March 6, 1899. This company has capital stock of \$38,000,000 and an authorized consolidated bond issue of a like amount. It is of this issue that the \$18,000,000 mentioned is offered for sale to the public. The United Railways and Electric company owns all the lines formerly operated by the Baltimore Consolidated Railway company, 207 miles; the Baltimore City Passenger Railway company, 56 1/2 miles; the Central Railway company, 36 1/4 miles; the Baltimore and Northern Electric Railway company, 38 1/2 miles, and all the bonds of the Baltimore, Middle River and Sparrow's Point Railroad, 14 1/2 miles, thus controlling all the passenger railways in the city of Baltimore and its vicinity.

MISCELLANEOUS.

It is said that Thomas A. Edison, Jr., and William Holzer have discovered a process for hardening steel, which, while it costs less than half that of the Harvey process, gives much superior results. To operate the new discovery the Thomas A. Edison, Jr., and William Holzer Steel and Iron Process company has been organized.

A. H. Belo & Co., publishers of the *Dallas News*, are having plans prepared for a three-story-and-base-ment, thoroughly fireproof, modern newspaper building, and their architect, H. M. Greene, Gaston building, Dallas, Texas, would like to get any information regarding novel electrical devices—any novelty that will attract attention.

There is a large amount of available land in Guatemala especially suited for the growth of the rubber-tree. In addition, there are large numbers of wild rubber-trees in the forests of the coast region. The government is desirous of fostering the cultivation of rubber, and late decrees not only protect the wild rubber-trees, but offer premiums of land for groves of rubber-trees planted after January 14, 1899.

TRADE NEWS.

The Western Electric company, prior to the recent rise in copper, greatly increased its stock of rubber-covered wire, and is prepared to meet the demand of the spring trade with reasonable prices and prompt shipments.

Roth Bros. & Co., who were recently burned out, have resumed business at 88-02 West Jackson street, Chicago, and are equipping their new factory with machinery, getting out patterns and making all necessary preparations to resume business. They expect to be able to fill orders with their usual promptness within the next two or three weeks.

Eugene Munsell & Co. of New York have opened a large mica factory in Ottawa, Canada. It is the intention to forward the mica direct from the mines to the factory in Ottawa, where it will be prepared for shipment to the United States. Ottawa as a mica center is perhaps the best known in Canada, and a large business has been carried on between

concerns in that city and firms in all the large cities of the United States.

The Warren Electric and Specialty company of Warren, Ohio, makes direct-current fan motors and transformers as well as incandescent lamps. All are known under the name of Peeries, and the new specialties are said to justify the title. Both 9067 and transformers are said to have exceptional efficiency, and they are put on the market at very reasonable prices.

F. V. Young has opened an office at 331 I. O. O. F. building, St. Louis, as a manufacturers' agent. He represents the Cleveland Electric company, which makes switches, cutouts and other appliances, having the exclusive agency for lower Illinois, Missouri, Kansas, Arkansas, Iowa, Nebraska and Colorado. Mr. Young is looking for a line of lamps, sockets, wire and other electric specialties.

With other carbon companies the Partridge Carbon company of Sandusky, Ohio, was recently absorbed into the carbon combination, and it will be interesting to the host of friends of the Partridge company's recent secretary and treasurer, J. S. Speer, to know that he has deemed it advisable to sever his connections with the absorbed company. Mr. Speer is one of the most aggressive and progressive young business men of the Middle West, and his successful efforts, with Mr. Partridge, in building up the company in Sandusky, Ohio, are well known. It is now announced that it will be but a few weeks before he will start again as a manufacturer of motor and generator carbon brushes. It is stated that Mr. Speer will have plenty of capital with which to back his new enterprise. Although he has not yet decided as to location, it is believed that his plant will be at Pittsburg of some point farther east. With a man of Mr. Speer's experience in the carbon trade at the head of this enterprise, it is safe to say that the new business will be successful from the start.

The interesting announcement is made that Mr. M. E. Baird, the general manager of the Eddy Electric Manufacturing company of Windsor, Conn., has opened a western office for the business of his company at 837 and 838 Marquette building, Chicago. The outlook for the electrical business in the West is so bright that the Eddy company has reached the conclusion that a branch office in Chicago will be necessary to handle the trade. The Eddy dynamos and motors have the record of years of successful operation and are known throughout the length and breadth of the country. In motor work, especially, the Eddy business is firmly established, and the list of plants in which power is supplied by Eddy motors is a long and imposing one. For some time, at least, Mr. Baird will give his personal attention to the affairs of the Chicago office, and as he is equally well known and equally at home in New York, Chicago or San Francisco, his presence in the western metropolis will be of great advantage to the company. Mr. Baird's business and social qualifications are so highly esteemed that his welcome to the electrical circles of Chicago will be unaffectedly sincere and cordial.

BUSINESS.

The Buckeye Electric company, through its western representative, J. H. Cooke, 753 Monadnock building, Chicago, reports many orders for the Buckeye incandescent lamp from Illinois, Wisconsin and Iowa. Mr. Cooke says that it is the purpose of the Buckeye people to camp on the trail of central-station managers everywhere.

An attachment for electrically igniting Welsbach burners is a desirable improvement, as the old method of lighting them with a taper always causes more or less of an explosion, which is detrimental to the burner mantle. The Electric Appliance company is pushing the sale of the Advance attachment for the Welsbach burners and finds that it sells very rapidly.

Seymour Swarts, president of the Swarts Metal Refining company, Chicago, reports a gratifying increase in the business of his company. As is well known, the Swarts company makes a specialty of buying old copper wire of any description, for which it pays the highest market price. It is said that those who have had scrap wire for sale have found the Swarts company very prompt and satisfactory in its dealings.

The L. B. Allen company, 6350 Star avenue, Chicago, exclusive manufacturer of the Allen soldering stick, is reported to be doing a larger business than ever before. Through the able management of C. A. Scott the Allen soldering stick is being used in every state in the country, and its worth is known to almost every electrical worker. It is said to be non-corrosive and very effective. A pamphlet will be mailed to those interested.

The Crescent Chemical company, 185 Dearborn street, Chicago, is sure that it will pay users of belts to look into the merits of Never Slip pulley covering, which it manufactures. This pulley covering is said to be a power, fuel and money saver; its chief object is to prevent belts from slipping. The many claims made for this pulley covering are set forth in a neat circular, which the Crescent company will be pleased to mail to anyone on application. The manufacturer exhibits a large number of testimonials from users.

Cass & Co. of Chicago state that they are in a position to furnish dynamos and motors, both new

and second-hand, as well as gas and gasoline engines. They have been appointed general western agents for the S. E. I. company's switchboard instruments

and for the Moloney transformers. They are also general western representatives for Perfection brushes, and have the agency for the Onondaga

Dynamo company. They will be pleased to see their friends at any time at their office and works at 54 and 60 South Canal street.

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued March 7, 1899.

620,503. Electrical Storage Battery and Plate Therefor. Rankin Kennedy, Bradford, England. Application filed September 9, 1897.

To plates for electrical storage batteries a central solid lead sheet is painted on one side with litharge and dilute sulphuric acid and on the other side with red lead and dilute sulphuric acid, with one or more layers or thicknesses of perforated lead sheets also painted with the same mixtures of litharge and red lead and sulphuric acid on each side of the central sheet, the litharge-painted sheets being placed on the litharge-painted side of the central sheet and the red lead-painted sheets on the other side thereof, the whole being in electrical contact and made solid around the edges by fusing or soldering

620,609. Motor. Edwin S. Pillsbury and Ferdinand Schwedtmann, St. Louis, Mo. Application filed March 18, 1898.

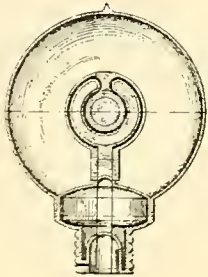
Claim is made for the combination with field magnets of an armature and its windings, a commutator therefor, brushes co-operating with the commutator, an insulation ring on the commutator, pivotally mounted centrifugally operated short-circuiting plates which normally rest against the insulation ring, and centrifugally operated devices for drawing the plates into engagement with the commutator segments when the motor has attained speed.

620,626. Electric Measuring Instrument. Clarence R. Weymouth, Alameda, Cal. Application filed November 30, 1898.

The combination in an electrical measuring instrument, having fixed and movable coils of a divided circuit, one branch containing a fixed coil, the other branch containing another fixed coil and a movable coil.

620,640. Electric Incandescent Lamp. Francis M. F. Cazin, Hoboken, N. J. Application filed September 11, 1895.

A three-part electric incandescent vacuum lamp is described, consisting of a suitable base, an air-exhausted glass bulb and a body or structure of solid matter, which constitutes a cohesive entirety and as such consists of two main constituents, namely, of a continuous linear semi-conductive, current-passing filament, which resists to a passing electric current to the effect of giving off light and heat, and which filament is electrically and chemically insulated from the other constituent by a protecting stratum, and a stratum of matter, which by the heat given off by the filament becomes luminous.



No. 620,640.

620,654. Electric Railway. Rudolph M. Hunter, Philadelphia, Pa. Application filed October 21, 1889.

The method of operating an electric railway consists in supplying high-tension currents of alternately increasing and decreasing potential to a circuit extending along the railway, converting by induction the high-tension currents into alternating currents of lower potential at intervals along the railway, delivering the low-tension currents to a single common continuous conductor, and delivering the low-tension currents from the conductor to independent electric motors upon a series of independent cars, so that the motors are in parallel, and independently controlling the current flowing through the motors.

620,665. Electric Arc Lamp. Moses S. Okun, New York, N. Y. Application filed January 16, 1896. Renewed August 11, 1898.

A carbon rod or feeder has several sections pivoted together, two of the pivots extending in one direction and two in the opposite direction, and a carbon holder pivotally connected with one of the sections by one of the pivots.

620,628. Apparatus for Controlling Operation of Motors. Clinton E. Woods, Chicago, Ill. Application filed February 12, 1898.

The controller is designed for varying the condition of a circuit, including a motor with a brake for engaging and checking the motion of a portion driven by the motor, operating mechanism for actuating the brake and controller, the controller being adapted to open or render ineffective the circuit through the motor, the operating mechanism being adapted, after having actuated the controller, to open or render ineffective the circuit through the motor, to disengage itself from the controller and in its further operation to apply the brake, and means for locking the controller in the position it occupies when the motor runs, it is opened or rendered ineffective thereby.

620,627. Process of and Apparatus for Reducing and Oxidizing Salts. Theodore A. Uehling, Cleveland, O. Application filed August 10, 1896.

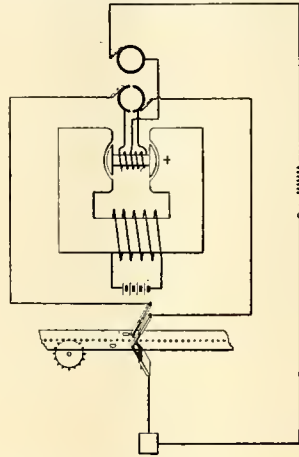
An electrolytic cell is divided into compartments by means of a partition, having an oxidizable salt in one of the compartments, a reducible salt in the other compartments, and electrodes projecting into or exposed in the compartments, the partition being built up or composed of a substance or material or materials obscuring communication between the electrolyte in the different compartments, but incapable of absorbing and transferring any other element than hydrogen liberated in one of the compartments, and permitting the element to pass therefrom under the influence of an electric current obtaining between the electrodes.

620,715. Connector for Electrical Conductors. Peter Minich, Independence, Mo. Application filed December 5, 1898.

As a new article of manufacture a fish-plate for track rails having a longitudinal groove therein and a recess communicating with the groove, and having its sides extending below the line of the groove in oppositely curved lines adapted to facilitate the unfolding of an extensible folding conductor of electricity, and an extension upon the opposite side of the fish-plate to that having the recess.

620,733. Telephone System. Charles L. Boyce, Detroit, Mich. Application filed April 29, 1898.

A derived signaling circuit is obtained by the combination with a metallic circuit telephone line normally disconnected from earth at subscriber's station, of an inductive resistance permanently bridged across the two wires of the metallic circuit at the subscriber's station, a telephone repeating coil permanently connected to the terminals of the metallic circuit at the central office, a line-signaling relay permanently connected to the neutral point of the line helix of the repeating coil, a source of electricity connected to earth, and means for connecting the neutral point of the inductive resistance at subscriber's station to earth, whereby line-signaling relay will be actuated.



No. 620,746.

620,745. Telephone Central-office Circuit. Henry M. Crane, Boston, Mass. Application filed October 31, 1898.

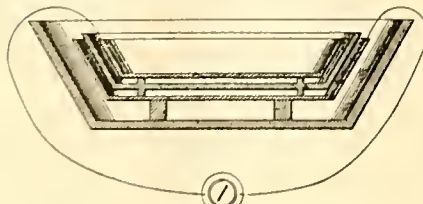
Claim is made for the combination in a multiple switchboard system, with a grounded test conductor uniting the test pieces of the switch sockets of a telephone line and a cut-off relay contained in the circuit thereof, of a normally disconnected source of test current, a main conductor including a resistance device extending therefrom, a normally discontinuous branch thereof including a signal-controlling relay, and switching devices adapted when operated to close the circuit of the source through the cut-off relay and signal-controlling relay in parallel branches, and to establish a testing potential upon the test pieces of the switch-sockets.

620,746. Means for Impressing Semicycles of Electromotive Force on Electric Circuits. Albert C. Crehore, Hanover, N. H., and George O. Squier, U. S. Army. Application filed January 4, 1899.

Telegraph transmitting apparatus is provided in connection with an alternating generator producing two alternating electromotive forces of the same periodicity and circuit-interrupting devices adapted to make and break circuit at instants when the current flow is actually zero and to impress the electromotive forces on the circuit so as to cause semicycles of current to flow in the desired order or relation and those in immediate succession to be of the same or opposite sign as desired.

620,759. Electric Arc Lamp. Charles Eschwei, New York, N. Y. Application filed February 3, 1898.

The lamp combines a solenoid, a magnetic core in the solenoid having a circumferential flange at its lower end, a lamp frame with parallel suspension rods, a cross piece sliding on the rods and being insulated therefrom, an upper carbon attached to the cross piece, a plate at the lower end of the suspension rods, a clutch provided with a tapering opening and resting at one side on the top plate, and a connecting rod pivoted at one side of the clutch and connected at its upper end with the circumferential flange of the solenoid core.



No. 620,755.

620,778. Transmitter for Multiple Telegraphs. Walter A. Houghtaling, New York, N. Y. Application filed December 22, 1898.

The combination is claimed in a telegraph transmitter of a movable contact, a pair of fixed contacts, suitable electrical connections for the contact with the main line and with a source of electricity respectively, a polarized magnet for controlling the movable contact having two coil windings, a source of electricity, separate branch conductors connected to the source and to the coils, respectively, to produce opposing magnetic effects, and a circuit breaker in one of the branches.

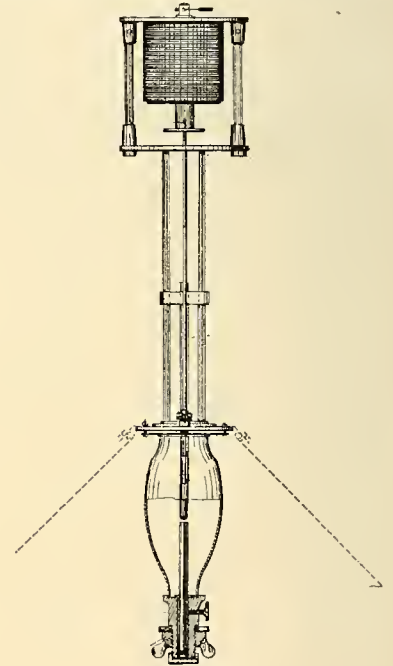
620,783. Electrical Regulator. William H. K. King, Carthage, Mo. Application filed September 20, 1898.

Receiving posts are connected with a suitable source of electricity; a vibrating arm has spring contacts extending between the contact points on the receiving posts; a delivery post is connected with each of the contact springs, and a clock mechanism is connected with and vibrating the arm and springs, whereby they may receive an automatic movement for alternating the current through the delivery posts.

620,806. Electric Train-signaling System. Benjamin C. Seaton, St. Louis, Mo. Application filed February 28, 1898.

An electric train-signaling system comprising the single-track rails having overlapping insulated sections and broken insulated joints, an auxiliary circuit rail and a signal station having for each side of the signal station a switchboard provided with circuit-closing switches for the several sections, a bell or annunciator, a circuit-closing key for communicating a signal from the signal station to a train, a switch for throwing the bell or annunciator in or out of circuit, and a connecting bar common to all the circuit-closing switches, whereby the latter are connected with the bell or annunciator.

620,839. Electric Switch. Walter B. Bernardini, Lakewood, and William Ely, Providence, R. I. Application filed August 11, 1896. Renewed October 6, 1898.



No. 620,759.

This switch has contact posts arranged in pairs or series, and knives or arms carried by a rotatable shaft for connecting the posts in pairs or series, and also having a stationary guideway combined with the parts, an arm pivoted upon the shaft and capable of partial rotation thereon without reference to the movement thereof, a crosshead capable of reciprocating movement in the guideway, a link pivoted to the arm and crosshead and connecting the two, an actuating lever pivoted independently of the shaft and arm, and adapted for engagement with the arm, and an extensible spring connecting the lever and crosshead.

620,852. Electric Railway. James F. Munsie, New York, N. Y. Application filed October 25, 1898.

A contact box for an electric-railway system is provided with two independent circuit-closers actuated at different positions of a traveling car and co-operating with a collector on the car adapted to hold both circuit-closers closed during transit of the car, and connections between a contact point or space in the track and an insulated supply conductor normally open at two points in the box, the points adapted to be closed by the joint operation of the two circuit-closers.

620,855. Thermo-chemical Electric Battery. Melvin L. Severy, Boston, Mass. Application filed April 8, 1895.

There are two electrodes of a material which is chemically inert to the liquids in the cell, and a conducting liquid in contact with each electrode, one of the liquids being a depolarizer. Means are provided for separating the liquids while maintaining the circuit.

620,864. Electric Clock. Joseph Butcher, Melrose, Mass. Application filed September 22, 1897.

One claim is given: In a clock the combination with a bell, its hammer and a rock-shaft to which the hammer is attached, of an electromagnet, its armature carried by said rock-shaft, a normally open electric circuit including a generator and said electromagnet, said circuit having terminals adjacent to the path of some part of the pendulum of the clock, the said pendulum, a movable interposing piece adapted to be moved into the space between the pendulum and one of said terminals, whereby the pendulum is caused to close the said circuit at each of its vibrations, means for regulating the number of strokes of the bell and means independent of the pendulum for operating the said interposing piece.

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No. 12

Chester D. Crandall.

Among the men who have contributed to the upbuilding of the electrical industry and assisted in placing it upon a solid commercial basis, Mr. Chester D. Crandall, the manager of the Western Electric company of Chicago, must be recognized as having played an important part. Mr. Crandall has been associated with electrical enterprises for 20 years, comprising his entire business career, and he has witnessed the growth of the industry from a very small beginning to its present leading position. His experience has been entirely with the financial, manufacturing and operating branches, and he has never attempted to engage in technical work, although through his associations and education he has cultivated a naturally keen interest in the scientific developments that have been made in this field.

Mr. Crandall is still a young man. He was born at Sacket's Harbor, Jefferson County, New York, on January 28, 1855, and received his education at the University of Rochester, from which he was graduated in 1879. From a study of the classics Mr. Crandall turned to the exacting duties of commercial life, and while he did not entirely dismiss the subjects which had occupied his early years, he reserved them for his hours of recreation and did not permit them to interfere with the more serious duties which he had assumed.

Upon completing his college course Mr. Crandall came to Chicago and entered the offices of the Western Electric company as a clerk. At that time, July, 1879, the concern occupied a comparatively small place on Kinzie street, and employed about 300 persons in the offices and factory combined—a large force for an electrical manufacturing company. For a year and a half Mr. Crandall was thus occupied in clerical duties, and in that time he had gained a good general knowledge of the business, and what was more to his benefit and credit, the confidence of his employers. He was sent to New York for a year and at the expiration of that time he was transferred to Indianapolis and made secretary of the Gilliland Electrical Manufacturing company, which had been purchased by the Western Electric company. The old corporation was continued until its affairs could be advantageously closed up, and during this period Mr. Crandall remained in Indianapolis as an officer of the company, representing the Western Electric company.

In 1882 the telephone-exchange business offered unusual inducements, and Mr. Crandall, whose familiarity with the manufacturing end of the industry and personal acquaintance among the leading telephone men of the country gave him excellent opportunities to study this field, determined to take advantage of the opening thus afforded. Accordingly, he organized the Missouri and Kansas Telephone company and opened an exchange at Kansas City, Mo. He was secretary and treasurer of the company, and under his immediate direction the business developed into a profitable enterprise. He remained in Kansas City for seven years and then returned to Chicago to re-enter the service of the Western Electric company, having resigned his position with the Missouri and Kansas Telephone Company.

He was appointed assistant treasurer of the Western Electric company in 1889 and was occupied with the financial affairs of the institution for several years. During Mr. Jackson's illness, and from the time of his death to the appointment of a new treasurer, Mr. Crandall was in charge of this important department. For a large portion of that time he had charge of the selling department as well, having been appointed manager upon the retirement of Mr. C. A. Brown. Mr. Crandall now devotes his entire attention to the management of the business of the Chicago end of this great institution.

Mr. Crandall is identified with several enterprises engaged in the development and application of electricity in various branches, the most important of which is an electric power-transmission undertaking in Mexico. This project is known as the Portezuelo Light and Power Company, an American corporation formed under the laws of Illinois. Mr. Crandall is president of this company, and he has given it considerable attention. A valuable water power is controlled by the company, and it will transmit current to Puebla, where it will be used in driving motors in the fac-

ories of that city. The initial installation will have 2,000 horse power capacity, which will be increased to 5,000 horse power. The company easily disposed of the 2,000 horse power before work was begun on the plant.

In private life Mr. Crandall has developed traits that have contributed to his success in his commercial enterprises. Straightforward, earnest, affable and considerate, he commands the esteem and respect of his personal friends as well as the confidence of his business associates.

Mr. Crandall is a member of the Union League club of Chicago and an associate member of the American Institute of Electrical Engineers.

Growth of the Electric-vehicle Industry.

If the New York newspapers are correctly informed, the electric-vehicle companies in New York are making their plans on a magnificent scale. The



CHESTER D. CRANDALL.

New York Electric Vehicle Transportation company, which was organized recently, and took over the 100 cabs of its predecessor, has ordered 200 more, and, it is said, expects to use an additional 1,500 before long. It is asserted also that the parent corporation, the Electric Vehicle company, will order 12,000 cabs this year. There is a question, however, whether the manufacturers can supply that number. Power to charge the electric cabs, it is stated, will be obtained from the plant of the Metropolitan Street Railway company, and it has been proposed to arrange a transfer system with that company, and possibly also with the elevated railway company, by means of which, at a charge, say, of 15 cents, patrons would be carried from their homes on the side streets to the railroad lines, where transfers would be given.

The Buffalo Automobile company is to be incorporated with a capital stock of \$100,000, and through the company an automobile-cab service will be established in the city of Buffalo. Its plan of operation will be similar to that of the New York Electric Vehicle Transportation company, but, in addition, the company will establish a line of automobile busses along West Side thoroughfares not now reached by the street cars. The promoters of the new company are said to be Dr. Truman J. Martin and Jewett M. Richmond of Buffalo.

Electrical Trade Conditions in New South Wales.

(Prepared for the WESTERN ELECTRICIAN by the Philadelphia Commercial Museum.)

There is a good opening for electrical material of every description in Sydney, New South Wales. Electric fans for ventilating purposes, for instance, have been favorably received in Sydney. They are used to a certain extent, and are very highly thought of by the users. Their use, however, has been very much limited, owing entirely to the fact that there are very few large electric supply stations. The majority of those are alternating current, and until recently there has not been a satisfactory small motor offered for this class of work.

In Sydney the Municipal Council holds the rights of electric supply and has taken no steps to erect a central station. Further, the council has declined to grant franchises to any person or company. The result is that the supply of electricity is carried out from small "block" stations, each with a very limited area of supply. Under such conditions the use of fans and electrical conveniences is necessarily very limited. The motor and fan in most general use is the Lundell, manufactured by the Sprague Electric company.

The situation is, however, bound to be changed, and with it will come more rapid electrical development, for which American manufacturers should be prepared. So far Americans have had but little to say in this market. England and Germany have been the source of supply. Out of a total of \$51,255 worth of electrical machinery imported in 1897 the United States contributed only \$1,935 worth, while \$40,025 worth was supplied by England; and out of \$384,290 worth of "electrical, telephone and telegraph materials" imported during the same year, the United States furnished only \$16,135 worth, while \$233,675 came from England and \$58,265 from Germany.

Electric lighting is in the background. The illuminating industry is represented by 30 gas-works, in which is invested \$3,150,000, while the electric installations number less than 30, with a horse power capacity of less than 3,000, of which not 2,000 is used; the invested capital is about \$500,000. An estimate of the extent to which business in the supply of electric materials of all kinds will be developed may be gauged by the fact that the colony possesses 2,027 churches, 3,467 schools, 93 hospitals, 43 places of public amusement, and over 3,000 manufacturing establishments.

Rapid transit in Sydney has been for years accomplished by means of able-bodied locomotives hauling double-deck open or closed cars over some of the principal streets, emitting from their smokestacks the dense, black, sulphurous smoke yielded so plentifully by the Newcastle coal. A few years ago the steam roads were supplemented by underground cable roads, and now both of these systems

are being superseded by the electric system. In fact, the electric traction system may now be said to be fairly started in Sydney, which means that it will ultimately find its way to the other towns, and in time furnish what the colony has so long badly needed, rapid and cheap means of transportation between points in the "Bush," as the country districts are called.

The local authorities would only agree at first to the substitution of the electric system on the George street line, but after the work had been begun they decided to regard the line no longer as an experiment, but as part of a permanent scheme of converting the steam roads into electrical lines, which, they became at length fully convinced, would furnish the most convenient system of traction for the city and suburbs. A power house was therefore built at Ultimo, several miles out from the city, and machinery ordered from the United States. At the last Sydney advices (January 14th) this had nearly all arrived, and the work was being forwarded expeditiously. When the conversion scheme is completed the city will be served by three lines, in addition to a cross-line in King street, and the Ultimo power house will have not alone to supply these lines, but to furnish electric energy for the North Sydney, Mosman and Willoughby systems, and a new line to Gore Hill, which is about to be built.

The cable from Wilson's Point to Ridge street is to be taken up and the whole system worked by electricity, and it is expected that in the near future Sydney will be able to lay claim to as extensive and perfect an electric system of traction as any city in the world. The fare in certain prescribed sections of the city will be two cents.

There is no reason why American makers should not enjoy their proper share of the Australian trade. On the contrary, there is every reason why they should. They have the advantage of a lower freight than their English competitors, and they can more than meet them in the quality, finish, serviceability and price of their goods. Machinery and mechanical appliances are admitted free of duty into New South Wales.

There has long been a supposition that because New South Wales, Queensland and the other Australian colonies were British dependencies, their traders would give preference to the mother country over other nations. In a recent speech the president of the Chamber of Commerce of Brisbane made it clear that this was not so. "For centuries," he says, "England has been the great 'clearing house' of the import and export trade of her possessions, but there is no imperative reason why we should continue to buy from her goods that she does not manufacture, nor sell to her produce she does use, if we can ourselves find a better market elsewhere. In looking out for such a market we are only following her own teachings of unrestricted and untrammelled trade. And, further, if the English manufacturers refuse to adapt themselves to our requirements, while those of other countries give a ready compliance to our wishes, it is only natural that our trade should follow in their direction."

The best way for an American maker of electrical material and supplies to enter the New South Wales market would be by opening up an agency in Sydney and establishing there a competent salesman who could make periodical trips through the adjacent territory to work up business. It is conceded that foreign houses in the colonies carrying stocks of goods have a distinct advantage over their competitors that do not. If it is not feasible to establish an agency in this way, there are many reliable importers of electrical machinery and appliances in Sydney who would be very glad to undertake American business. It may be proper to mention that the names of these, their standing, etc., is on file in the information bureau of the Philadelphia Commercial Museum, through which can also be obtained precise data as to selling terms, freight rates, packing, etc.

Gorge Road at Niagara Falls.

The great and famous Gorge road at Niagara is now in the hands of a receiver, and its future is quite uncertain. For some weeks the cars of the line have not been in operation, and it is reported that the road is likely to become the property of the New York Central Railroad company. Another report states that it will become a part of the holdings of the International Traction company, which is the name announced for the \$25,000,000 syndicate that has purchased the Niagara and Buffalo electric roads.

The trip through the Niagara gorge on this road is one of the most delightful imaginable, but a profitable business is possible only for a few months in the year in the summer season when visitors at the Falls are numerous. However, before the line is again operated it will require a large amount of repair work, and quite an outlay will be necessary to clear the tracks of the debris that has come down from the cliffs during the winter months. In some places the tracks are almost entirely covered with rock, while in other places huge boulders block the path of the cars. Considerable ballasting will have to be done, and in some places cribwork will have to be built. Located as the road is along the water's edge, it forms a resting place for the ice and rocks that tumble down from the cliff in the early spring, and unless this matter is promptly removed it soon gathers in goodly quantities. In the summer, when the dry season prevails, this trouble is not experienced, and the trip is full of pleasure and practically free from danger.

Reported Expansion of the Westinghouse Interests.

It is reported that an important addition to the number of Westinghouse companies is about to be made. The new company will be a European concern, it is said, and it is the gossip of electrical circles in Chicago that Mr. Maurice Coster, at present Chicago manager of the Westinghouse Electric and Manufacturing company, will soon form a new connection, and that his headquarters will hereafter be in Paris. If this prove to be true, Mr. Coster's friends will extend very hearty congratulations, as the advancement is a flattering recognition of his cosmopolitan ability as a manager of electrical sales.

The San Gabriel Electric Power company has applied to the council of Santa Ana, Cal., for franchise to put in a large electric-lighting and power plant in that city. It is claimed that this is the first step toward establishing a line for light and power to all towns from San Gabriel to San Diego, including Whittier, Buena Park, Fullerton, Anaheim, Orange, Santa Ana, Tustin, Oceanside and San Diego.

Trend of Central-station Design.¹

By B. J. ARNOLD.

It is only a little over a decade since the electrical student was told by those who were supposed to be authority that to get a reasonable efficiency in electrical machinery high rotative speed in the moving parts was necessary. While this statement contains an element of truth, it is by no means so important as at first supposed, for our slow-speed generators and motors of to-day are more efficient than many of the high-speed machines of that time. Difficulties in the manufacture of heavy electrical machinery and lack of knowledge on the part of the designers of that time were probably responsible for the false idea; but, be that as it may, the result was to flood the country with electrical plants, consisting of engines, dynamos, pulley shafting and belts, good, bad and indifferent, and thrown together in almost any manner. These, however, performed their functions remarkably well under the circumstances, and enabled the youngest branch of the engineering industry to command the brains, energy and capital necessary to revolutionize the transportation and factory methods of our cities and make itself felt in many of the homes of our smaller cities and towns. But since Darwin's law of "the survival of the fittest" applies equally in engineering and in natural history, the belts and pulleys are gradually becoming extinct; the engines and generators have left off their prehistoric ear-marks and have grown to their responsibilities and to the possession of those elements which make them the bulwarks of electrical industries, the

which simply speaks well for the engineers and designers, and more especially the manufacturing companies who installed them in the earlier days, because at that time there were few engineers skilled in this branch of work, except those employed by the manufacturers.

The points in accepted practice may thus be summarized:

Water-tube boilers, capable of carrying high steam pressures. This probably will be disputed somewhat by the advocates of other types of boilers, and with some reason, but it nevertheless has become almost standard to use water-tube boilers in modern central stations.

Mechanical stokers, or improved furnaces or grates.

Self-supporting brick or steel stacks, usually steel. A steel stack can be put up for considerably less money than a brick stack, and for all practical purposes it is equally as good, and can be maintained a sufficient number of years to warrant its adoption in almost every case, if properly looked after.

High-pressure steam piping is not duplicated, as was thought necessary by engineers eight or ten years ago, practice having proven that one single steam header can be divided so as to make a plant reliable if the engines are properly located with reference to the boilers and the header. I planned one plant in 1891 with a duplicate system of steam piping, and I firmly believed in it at that time, but have never since had occasion to use the duplicate system, and have never since installed one. I think there are few engineers in the country to-day putting in plants with duplicate systems of piping, unless in buildings



GORGE ROAD AT NIAGARA FALLS.—CONDITION OF TRACKS IN SPRING.

same as the older types of steam engines were to the factories which they drove prior to the advent of electrical transmission. To determine how far this development has gone and its probable tendency in the future is the subject assigned me by your committee to discuss to-day.

The problem which confronts the power-station designer is almost invariably that of the operation of arc lamps, incandescent lamps and motors for various purposes, with the greatest degree of economy, and with as little expenditure in first cost of plant as possible. This is strictly true of combined lighting and power stations, which present the most difficult cases to handle. When, however, the problem is simply one of the development of electrical energy for power purposes only, such as railway work or transmission work, it becomes much simplified. Since the question of the design of a station is interlinked with and dependent upon the system of distribution adopted, we find ourselves struggling with many of the old questions and some new ones, such as the alternating arc versus the series arc and the constant-potential arc, the polyphase transmission plant versus the direct current, the advisable voltage, either alternating or direct, to adopt for central-station work.

While I do not in this paper presume to settle these questions, I will endeavor to convey some idea of their probable solution for general cases; otherwise we can hardly expect to speculate on the "Trend of Central-station Design." The old belted station we may consider obsolete, and come at once to the general types which have been recently installed by competent engineers, and which may be considered as embodying the latest ideas of those skilled in this class of work. In all of these stations we find certain main parts which may be considered as accepted practice. Of course, there are many belted stations running and doing excellent service.

¹ Address before the Northwestern Electrical Association at Milwaukee, January 18, 1899.

where it seems necessary to do it, and on account of the peculiar location of the engines with reference to the boilers. Steam piping costs excessively in a power station, and the less of it put in the better, because there is then less radiating surface to waste heat and fewer parts to keep up. The diameters of the steam heaters which are being placed nowadays are somewhat decreased, as compared with those installed four or five years ago.

Large compound condensing steam units. It has become accepted practice to install as large engines as practical, on account of the decreased cost per horse power and the increased economy of a large engine over a small one. They are almost invariably compound engines, where it is possible to condense, and in many cases whether it is possible to condense or not. The tendency toward triple-expansion work is not as strong as it was five years ago. It has been determined that for almost all cases a compound engine will get nearly as good economy as a triple-expansion engine, and in many cases just as good; it requires less investment, is less costly to maintain, and the difference in economy of the triple-expansion over the compound is so slight that it makes it inadvisable to install, except in exceptionally large sizes. On account of the excessive diameters of the low-pressure steam cylinders in large compound engines it is the practice to install triple-cylinder compound engines; that is, to divide the low-pressure cylinder into two smaller cylinders, the combined area of the two being equal to the area of the large cylinder of a single compound engine.

Direct-connected generators of large capacity. What has been said in general regarding large steam units applies equally to electrical generators, because the larger the unit the greater the economy of the combined unit.

To these chief features of design, which have become so generally accepted as to require little or no discussion, there may be added several features which

may be justly called "tendencies" or "trends," which have not yet been universally adopted.

Economizers come under the first heading. Economizers, as you are aware, consist of a series of vertical cast-iron tubes carrying water within them, and around the outside of which the gases pass from the boilers to the smokestack. There is no doubt, in my judgment, but that there is economy in the use of an economizer, ranging from five to seven or eight and sometimes as high as 10 per cent. In order to get the benefit of an economizer, ample draft must be provided. Sometimes an economizer is installed where the draft is poor, the result being no economy and the annihilation of the draft. There is only one solution for this, and that is to increase the height of the stack or introduce mechanical draft to realize the benefits of the economizer.

Mechanical draft. Under this head there are two types, induced draft and forced draft. Induced draft is a device which consists of a large fan or fans, driven by steam engines or electric motors, which are placed between the economizers and the smokestack, or, if economizers are not used, between the boiler flues and the smokestack, the object being to draw or suck the smoke from the boilers through the fan and deliver it into the stack. The advantages of the induced-draft scheme are, first, a lower and less expensive stack can be used; in fact, no stack at all is required except to get the gases above the buildings in the immediate neighborhood of the property; and, secondly, the fires can be handled under any and all conditions. We are all aware that the condition of the atmosphere changes our draft, and in case a stack is no larger than is required, there

of the evaporation. The five per cent, must be added from the city waterworks, or other outside source.

In place of the cooling tower, where real estate is cheap and available, a table can be erected, consisting of a series of boards laid gridiron-shape, upon which the water is delivered by the condenser pumps and is sprinkled down through the boards, and the air from the atmosphere penetrating through underneath the shelves comes in contact with the hot water and cools it. It then forms a pool at the base of the shelves and is taken from there and pumped back in contact with the steam in the same manner as in the cooling tower. This device can be installed for the same, or less, amount than a cooling tower, and it is advisable to install it where there is sufficient real estate to place it upon, because it requires no power to cool the water, and power is required to drive the fan of a cooling tower.

Motor-driven auxiliaries. Many of the most modern plants are equipped with electrically driven air pumps, boiler-feed pumps and cooling-tower motors, if tower is used. There is a question as to whether this is the most economical thing to do or not. Some believe it to be so. Others maintain that the latent heat derived from the exhaust from the steam cylinders of the steam-driven auxiliaries, if run through a surface or closed heater, more than compensates for the wasteful use of the steam by these steam pumps. I incline toward the belief that there is economy in the use of electrically driven auxiliaries, on account of the non-wasting of heat by pipe radiation, if for no other reason, because the primary objects to be obtained in a power station are to generate the steam with as little fuel as possible, lead

quite extensively in Europe, but not in this country. It consists simply of a commutator revolved by an independent source of power, a small steam engine or motor, belted or directly connected. This commutator will take in alternating current on one side and deliver one, two or three-phase current on the other, accomplishing the same result as a rotary converter, without the use of the field coils or any revolving portion except commutators; and it seems to me that we are somewhat behind in not looking into it more thoroughly in this country, for it certainly can be manufactured for less money than the rotary converter. This is mentioned merely as a tendency in transmission work. The efficiency of it is about 97 per cent.

We now come to what is at present known as the combination generator, which wants a name, and the man who can successfully name it and have his suggestion generally adopted, will, in a sense, become electrically immortal. It consists of a machine having two commutators and capable of generating current at two voltages. It may be direct current on each end or alternating current on one end and direct on the other, but, in either case, it is a machine deriving its power from an external source in contradistinction to a rotary converter, which revolves itself by means of the current passing through it. These machines are coming into use for railway work, telegraphy and printing-office work. They seem to be the connecting link between the alternating and direct-current apparatus. A power station installed with such machines is capable of generating polyphase currents and transmitting such current by means of static transformer to a long distance at a high potential, then running through rotary converters and delivering out on the line direct current, thus enabling us to utilize our direct-current motors which are already installed. The efficiency of such a machine is from 92 to 98 per cent., dependent upon its size.

Boosters. Under this head there are two, rotary and static. The rotary booster is a machine consisting of two dynamo-electric machines, one of which is a motor, which may be either alternating or direct current, directly coupled or belted to a generator, either alternating or direct-current or arc. This machine is used mainly at the present time for use on long-distance feeders in railway and central-station work. The generator end of the machine is series-wound, and through it passes all the current which goes through the feeder to which it is attached. It is a low-voltage machine, and increases the voltage on the feeder to which it is attached a sufficient amount to enable current to be delivered at the end of a long feeder at the same pressure that is delivered at the ends of shorter feeders connected with the system. In other words, it is a device to save copper. But when it is used the line loss is increased. However, under conditions where, for short periods of the day, the load is heavy, it pays to do this instead of adding the requisite amount of copper. It is adopted in a number of the Edison central stations of the country at the present time and in some railroad plants. It is also largely used in stations operating storage batteries for increasing the potential when charging. The efficiency of such a machine is from 80 to 85 per cent.

A static booster is practically a transformer, and is intended to help upon the long feeders of alternating systems. It performs the same function that the rotary booster does, by raising the pressure of the long feeder to a higher potential, so as to make the current delivered of the proper potential. It has an efficiency of 90 to 97 per cent.

Storage-battery auxiliary. The advantages of this feature have been so thoroughly discussed of late that it will be unnecessary for me to enter further into a discussion of its merits. While some engineers are not yet ready to consider its use established practice, its adoption by many of the leading direct-current stations of this country should prove its usefulness. I say this impartially, because I have no connection with any battery interests at the present time, although I have had until recently.

There is one type of machine whose future has not as yet been determined, and perhaps no man can at present safely foretell its future, but there seems to be a demand for it. I refer to the multi-current arc dynamo. There is such a machine made to deliver current for four circuits of about 100 lights each, and if the series are to survive, this type, made to deliver current for five to 100-light circuits, will be the arc machine of the future, and it will revolve at the same rate of speed as our present direct connected incandescent or alternating machines do, because we must eliminate belts. I am speaking of large stations, and I believe that if the series are to survive it will be driven by large machines with slow rotative speeds. Such a machine will probably not have an efficiency greater than from 80 to 82 per cent., and that is what militates against it, the same as the low efficiency of the present series-arc machine does.

Having thus enumerated somewhat briefly the principal factors which are working to shape the design of the future central station, I will briefly describe two types of stations which have lately been built, and seem to represent the latest practice.

1. The composite station, consisting of two or more independent steam units, carrying upon the engine shaft a direct-connected generator suitable for giving light or power, and, in addition, a pulley or



GORGE ROAD AT NIAGARA FALLS —SAND AND BROKEN STONE WASHED DOWN DURING WINTER.

are days when it is difficult to hold steam, and it becomes necessary to put more boilers into service than would be necessary if a mechanical-draft fan were used. Where the economizers can be installed in connection with induced draft an economy is always effected.

Then there is the forced draft, which consists in blowing air under the grates of the boiler and forcing it up through the fire and into the stack, which is supposed to perform the same function that the induced draft does. The objections to it are that inasmuch as it creates pressure in the firebox, the gases are liable to escape out into the room and make a distasteful fireroom. Otherwise, the results accomplished are practically the same as with induced draft, and it is considerably less expensive to install, and this is its chief advantage.

Cooling devices. Under this head come cooling towers and cooling tables. In most plants in this country there are probably no facilities or natural opportunities for getting water for condensing purposes, and, until recently, we have thought it was advisable to continue to operate these plants non-condensing. During the last two years there has been a tendency to put in these cooling towers, and when properly put in there is always an economy effected, resulting in a net saving of at least 15 per cent. in fuel. A tower consists of a series of vertical tubes or sheets, usually within a wrought-iron frame, through which air is forced by blowers, driven by steam engines or electric motors, and down through which flows, or sprinkles, or is spread, the water delivered from the condensers. The water coming in contact with the air is cooled and accumulates at the bottom of the tower, and is then pumped into contact with the steam and condenses it. The same water is used over and over, so that only from five to 10 per cent. will have to be renewed on account

it as direct as possible to the steam cylinders where it is to do its work, and exhaust it into the vacuum as quickly, with as little pipe to radiate heat as possible; and electrically driven auxiliaries seem to me to accomplish this result better than any other.

The rotary converter is a machine for converting from one form of current to another, or from one pressure to another pressure of the same form of current. A machine for converting alternating to direct current or vice versa, consists of a single armature revolving in one field, carrying two commutators, one direct on one side, and three-phase, two-phase or single-phase rings on the other, being capable of taking alternating current into the phase or ring side and delivering direct current on the other or commutator side.

These devices are coming rapidly into use for transmission work. A number of the most modern railroads in Europe and in this country have been equipped in this way during the last year, and with excellent results. There is one road where this device has been put in under my own supervision, which has been operating satisfactorily since the first of last July, transmitting three-phase at 5,500 volts and then converting it to direct current and delivering it out on the line of 600 volts. In most cases 95 to 97 per cent. efficiency may be depended upon, if the machine is reasonably large and operated at full load.

Under this head may be classified the synchronous motor driving series-arc machines. One type of modern central station is utilizing its old series-arc machines for supplying other circuits by driving them with synchronous motors, in case it is an alternating plant. This makes a very good combination and eliminates belts entirely from the station. The efficiency of such combined synchronous motor with arc machine is seldom more than 72 to 75 per cent.

One device, known as a rectifier, has been used

flywheel carrying a belt or rope driving a common shaft, to which the other engines similarly drive, and from which small direct-current arc machines or other old-style machines derive their power. This type is admirably adapted for utilizing out-of-date machinery. There have been several large plants of this style installed in the last two or three years by a leading firm of engineers, and the stations, I under-

stand, are giving excellent satisfaction. I refer particularly to the stations at Toledo and Washington, and the solutions of the particular conditions of those cases seem happy ones, because they enable the owners of the properties to utilize all of their old machinery until such times as it may be deemed advisable to change.

current can be obtained from such a plant by making all of the generating units alike, so far as kind of current is concerned, and driving secondary generators by means of motors running from the main generators. This means is often adopted in rebuilding old plants for driving the old series-arc machines, which are directly coupled to an alternating or direct-current motor, driven from the main bus-bars.

advantage of you, I will refrain from discussing the merits or demerits of this system. It is claimed by its advocates to have certain advantages.

The PRESIDENT: We would like to have you explain the system.

Mr. ARNOLD: Gentlemen, I am really sincere in my position.

Mr. NORCROSS: Well, you have gone too far to retreat now. (Laughter.)

Mr. ARNOLD: I thought that possibly, if you cared to know about it, the matter could be brought out in the discussion, but I prefer to refrain from making further reference to the system in my address. I have no desire to advertise it under such circumstances, and wish to present the subject of my paper as impartially as possible.

In conclusion, we all know that our ideal central station will be designed when we have secured an electric generator capable of producing energy for universal use, and the necessary auxiliaries in the way of motors and lights to satisfactorily use this energy for all purposes, when distance is taken into account. Our expectations and our hopes point toward the alternating machine, but before we can accept it as our ameliorator we must ask its advocates to produce a motor which will start and operate successfully on variable loads without seriously affecting the balance of the plant, and of producing a given amount of light with the same energy and cleanliness that is now provided by means of the direct-current arc and incandescent lamp.

I, personally, lean toward the alternating system, but if we are frank with ourselves we must admit that while the promoters of the alternating system have made very rapid strides in the last five years in the perfection of their machinery, and have overcome difficulties which five years ago seemed insurmountable, there are certain elements which they have not overcome, and which we hope they will overcome; but the chief difficulty of the present time is in getting an alternating motor which can be used on such work as printing-press work, which is exacting in the extreme, and upon electric-elevator work, which is one of the chief sources of revenue for central-station plants, especially in large cities, and also an arc lamp which will run upon practically the same energy as a direct series-arc lamp. The alternating arc lamp of to-day has been greatly perfected, and is almost perfect so far as the quality of light is concerned and absence of noise. It, however, has a slight deposit of ashes in the globe, which requires it to be cleaned oftener than the direct-current lamp, and absorbs or consumes somewhat more energy than the other type of arc lamp, and while it is to be hoped that these objections will be removed, and they probably will be, we have not yet reached the point where we can place them exactly on a par with the other type of lamps.

I believe that the connecting link between the present direct-current station and the future alternating-central station lies in what I have mentioned before, in the combination generator. We can install machines to-day which will produce both direct current and alternating current and which will drive our present direct-current motors satisfactorily, until the time comes when the alternating motor is perfected. Then, by simply taking off the commutators of the same machines, you can convert them immediately to do alternating work, without any additional expense. I believe that the central stations of the present, and for several years to come, will be designed on these lines and with combination machines.

DISCUSSION.

Mr. LIVERMORE: I would like to hear Mr. Arnold tell us a little more about his system. I never fully understood it. If he would explain it more fully we would all feel highly gratified.

Mr. ARNOLD: I want to express my appreciation of the invitation, but I was thoroughly sincere in my position of not desiring to take advantage of you under these circumstances, because if the system has any merit to it, it will probably come out of its own accord. The scheme is, in general, this: It is a direct-connected system throughout. There are no belts used. There has recently been a plant installed under this system of 5,000 kilowatts ultimate capacity, 1,500 of which is now running, and I will describe it, and from the description you may get an idea of what the system is. One engine is installed with a shaft terminating in a flange. Then sufficient room is left for two generators, and then another engine is installed, having a flange on each end of its shaft to which to connect generators. Between the two engines are placed two generators having their shafts in line with the engine shafts. These generators are mounted on hollow shafts or quills carried in their own bearings. Beginning at the end of one engine shaft and extending through the quills, but not touching them, to the other engine shaft is an auxiliary shaft carried in two bearings near its center. With this auxiliary shaft, which is independent of either engine or generator shaft, either one or both the generators between the engines can be connected to either engine when in motion or standing still. This interior shaft does not revolve under normal conditions, but lies idle to be taken up in an emergency, and under normal conditions you drive directly connected. You can add machines, generators and engines, in line, if you choose, and when you get another engine you have four generators available

[Continued on page 176.]

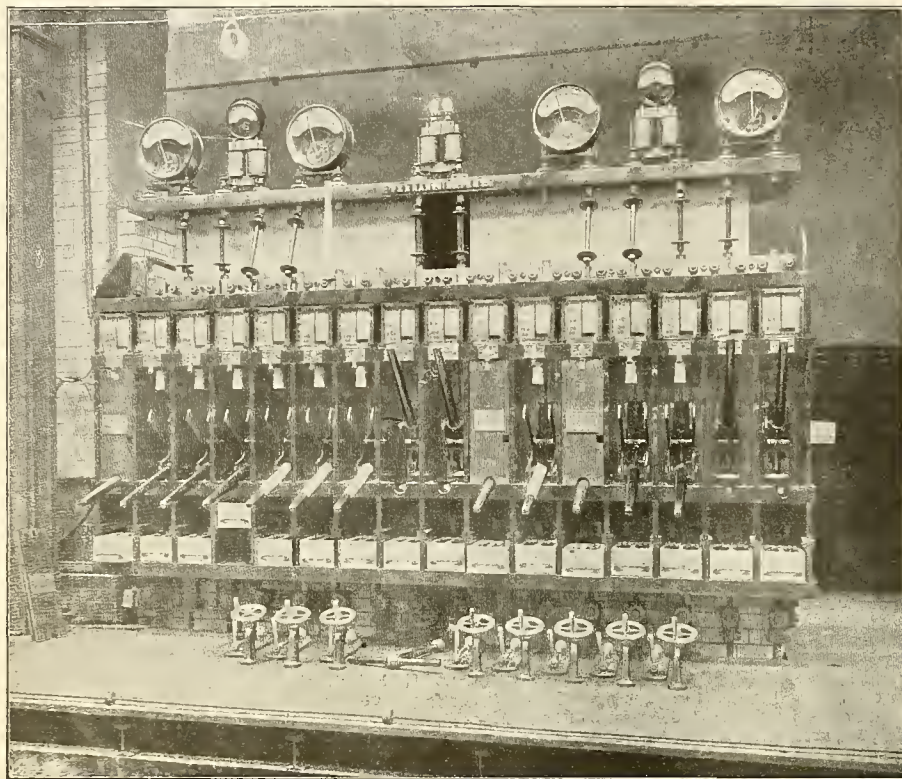


FIG. 2. ELECTRIC LIGHTING IN LONDON.

stand, are giving excellent satisfaction. I refer particularly to the stations at Toledo and Washington, and the solutions of the particular conditions of those cases seem happy ones, because they enable the owners of the properties to utilize all of their old machinery until such times as it may be deemed advisable to change.

2. The second consists of independent engines car-

While the stations I mentioned a few moments ago are good engineering, I believe this is better engineering; that is, to eliminate belts entirely, and if we have a number of different types of machines to drive, we had better produce our energy from standard machines of the same character and size, if possible; then drive the older type of high-speed machine, directly connected, from motors; and the effi-

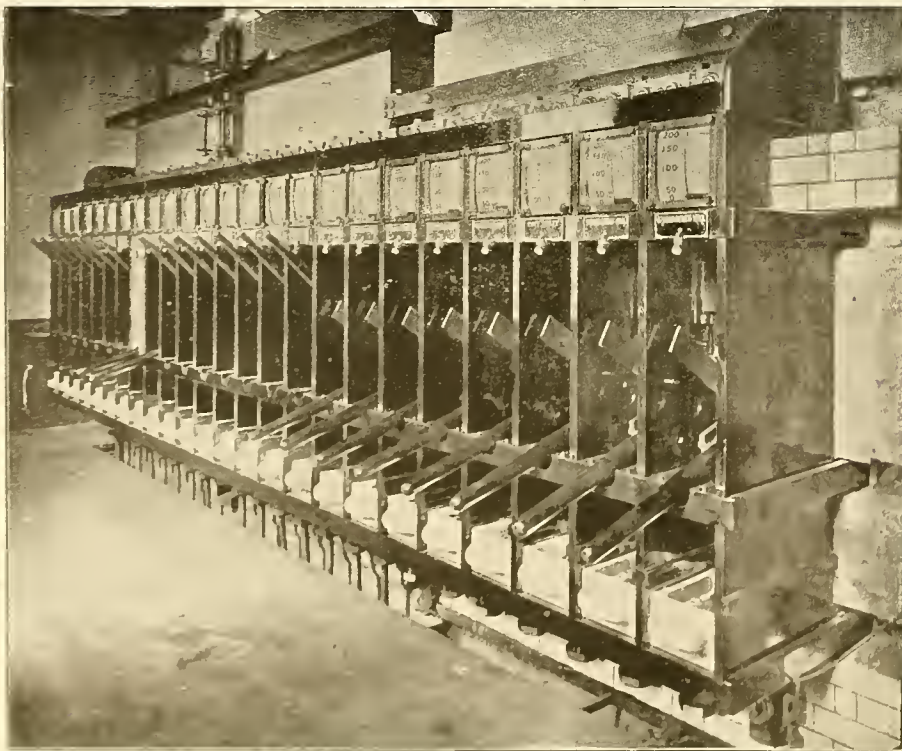


FIG. 3. ELECTRIC LIGHTING IN LONDON.

rying direct-connected generators. This type is admirably adapted for plants where but one kind of current is delivered, but in case two kinds are required, it becomes necessary to have a generator of each type upon each engine shaft, or have double the number of reserve units that would be required if but one kind of current were desired from the plant. In either case the investment in plant becomes excessive to insure reliability. Two or more kinds of

ciency of the combined plant will, I believe, be better than where the belted type is used.

3. There is one other method of construction, which I will not class as accepted, but mention it as a tendency in power-station design, known as the "Arnold system." There have been several of these plants installed, in which the generators are carried on independent bearings and all made available from more than one engine, but as I do not wish to take

Electric Lighting in London.

The accompanying illustrations, which are reproduced from the London *Electrical Review*, show interesting features of the equipment of the City of London Electric Lighting company's works at Bankside on the south side of the Thames. A lofty building has been erected on the wharf, and is connected to the main building by a bridge placed at an elevation of 50 feet. A fleet of barges is employed to bring the coal alongside this wharf, and a complete equipment of hydraulic appliances is placed in the building capable of hoisting the coal and other materials to a capacious bunker and store room on the top of the building. On the ground floor the pumping machinery is placed, for the purpose of drawing water from the Thames for condensing purposes. Centrifugal pumps are employed, two being driven by steam engines; a smaller set is connected to electric motors.

The engine room occupies a long building having a gallery on each side, the dimensions being 430 feet long and 45 feet wide, and contains engines and dynamos of different sizes, numbering 30 sets, the largest being capable of giving an output of 1,500 kilowatts, about 2,500 indicated horse power. The output from these machines is controlled by two distinct main switchboards, placed on the controlling gallery, together with subsidiary switchboards for other purposes. These switchboards are constructed entirely of incombustible material. Three traveling cranes have been installed, each capable of handling 45 tons. These cranes are driven and the several movements controlled by electric motors. The steam gallery on the opposite side of the room provides every convenience for manipulating the steam valves to each engine and also the large valves in the main steam pipes. A feature of the arrangement of the water

As already intimated, the electrical equipment is a heterogeneous collection, containing almost every variety of electric generating plant—continuous-current, alternating-current, high-speed, low-speed, direct-coupled, belted, antiquated and modern. In the long main machinery hall, for example, are to be found eight Thomson-Houston generators direct-coupled to Willans engines; an equal number of open-type Brush engines direct-coupled to Brush alternators, some with the original Mordey coils on them, others with coils of the Ferranti type; while ranged alongside these are a number of direct-coupled exciter sets and steam-driven pump sets. In an adjoining machinery room is to be found a number of Thomson-Houston and Brush arc lighters, belt-driven by steam engines, and, in a smaller machinery room adjoining this, two small continuous-current plants, which have been recently put into operation. In still another machinery room at the farther end of the rambling pile of buildings, there will shortly be erected three large continuous-current direct-coupled plants for dealing with the motor load. The most important factor in the entire combination is the Ferranti apparatus recently installed, comprising two direct-coupled engine-dynamo units of 2,500 horse

pumps) through gearing, which reduces the speed of the vertical shaft to half that of the engine. There are two steam and two exhaust grid valves to each cylinder. The high-pressure steam valves are driven by the Ferranti trip gear, consisting of eccentrics on vertical shafts working a rocker arm which moves a gun-metal cross-head carrying engaging teeth, which strike into catch blocks on the valve spindle. When the rocker is in its two extreme positions, and moves the valve from its central position, it admits steam until disengaged by tripping piece working over a graduated wedge. The position of this wedge is controlled by a dead-weight governor, driven through gearing from the second-motion shaft. The valve, when moved from central position, compresses two springs on the farther end of the cylinder, which, when the releasing takes place, returns the valve to a central position, the blow being fended by a piston on the valve spindle working in an oil dash-pot. The low-pressure steam valves and both high-pressure and low-pressure exhaust valves are actuated by cams on a vertical shaft, which also produce a similar motion. The lubrication to the valve gear is by drip-feed boxes, filled from the main oil supply, the valve-gear boxes draining into the engine col-

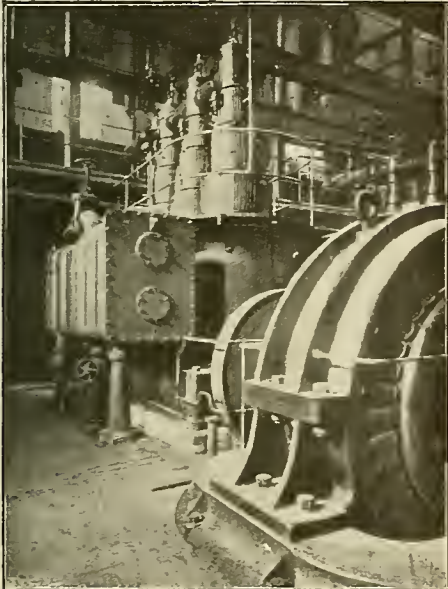


FIG. 4. ELECTRIC LIGHTING IN LONDON.

service to feed the boilers enables the whole of the work to be performed from the gallery, entirely distinct from the ordinary work of the stokers.

The boiler house adjoins the engine room, and contains 33 large water-tube boilers, all fed by automatic stokers, which receive the fuel by chutes or tubes from the coal store overhead, containing about 2,000 tons of coal, all of which is transported from the wharf bunker by means of a long-chain coal conveyor, with broad links which push the coal along a trough. A similar conveyor removes the ashes from the boiler house and deposits them in a bucket elevator, which enables them to be deposited on the wharf for removal.

Other buildings contain machines for the arc lighting of the streets of the city and continuous current for motive-power supply.

The original plans of the company provided for two stations, but this idea was abandoned and one central-station plant decided upon, although the city is divided into two portions and the station equipment is likewise arranged into two distinct sections, one half of the station supplying one district of the city and the other half feeding the remainder. The machinery is also controlled from two separate boards, and the working arrangements are so distinct that while one section of the machinery is working at full load, due generally to a fog over a portion of the city, the other is doing practically nothing. A method of intercommunication between the two sections is maintained by means of interconnecting switches, so that a machine from one portion could be connected onto the other side of the works, or, when the necessity arises, such as at times of small demand, the two sections of the city can be supplied from either section of the works. There is no doubt that the conditions of supply are exceptionally difficult, owing, mainly, to the short space of time in which the city occasionally is enveloped in fog. With the exception of street lighting there is practically no summer load, yet even at the end of May, during a fog, the load has been known to rise within a few minutes from 1,400 kilowatts to 5,000 kilowatts.

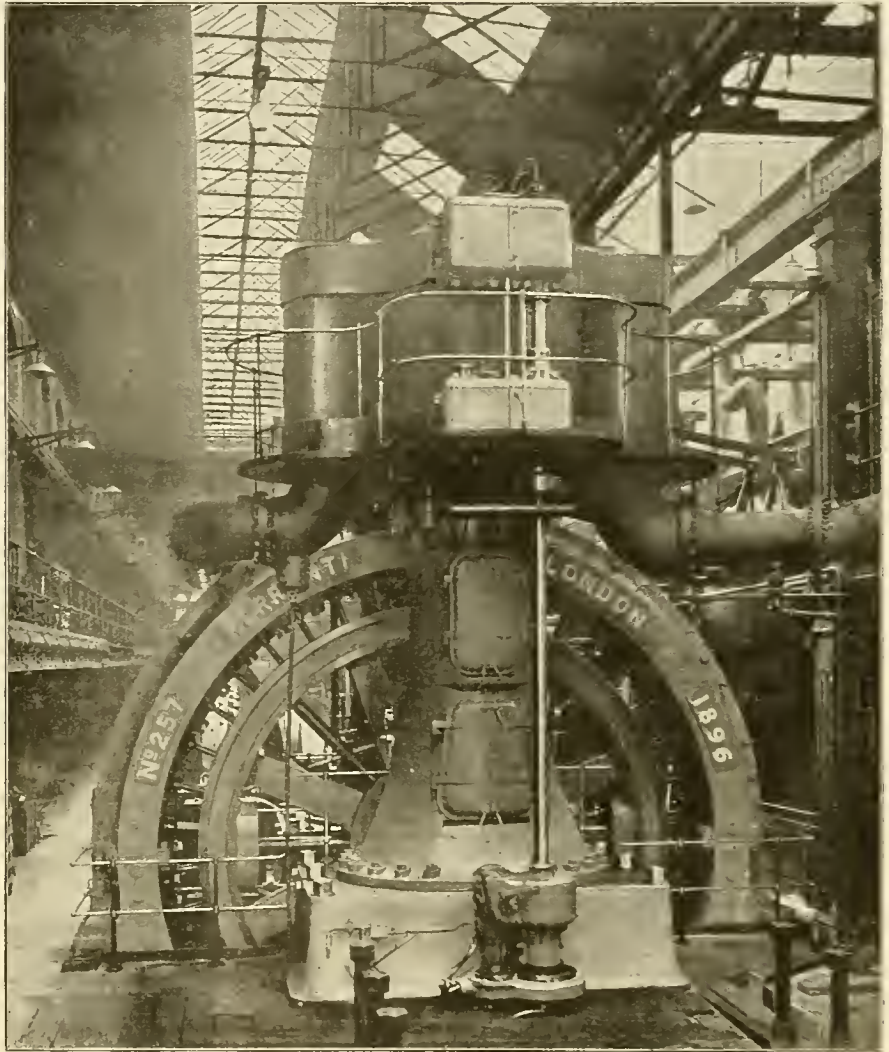


FIG. 1. ELECTRIC LIGHTING IN LONDON.

power each. A view of one of these units is presented in Fig. 1.

The Ferranti steam engine is of the compound vertical type with high and low-pressure cylinders on opposite sides of the flywheel alternators. The diameters of the cylinders are 38 inches and 68 inches respectively, each with a 30-inch stroke, and the normal speed is 150 revolutions per minute. The cranks are overhung, there being no outside bearings. Thus the shaft of each set runs in two main spherical bearings, white-metalled, one carried on the high-pressure and the other on the low-pressure bedplates. The weight of the wheel, complete with shafts, disks, bolbins and bolts, is 60 tons, and is taken on two roller bearings hung on springs resting on brackets on bedplates. The over-all periphery of the armature is 20 feet. The wheel is cast in two halves with eight cast arms. The halves are held together by steel links shrunk on bosses cast on to the inside of the rim. The whole wheel is connected to its shaft by two steel rings shrunk on turned registers of the cast boss of the wheel. Throughout, forced lubrication is distributed from pressure tank to the bearings at a pressure of 50 pounds. The oil leaking cut falls into the center of the bedplate, where it is strained before passing into oil tanks under the bedplates. The valve gear is driven from a vertical shaft by a second motion shaft driven from the crank pin (which also drives valveless oscillating oil

um. The clearance spaces for steam are reduced to a minimum, being limited to the actual piston clearance, the valves admitting and exhausting direct onto the top or bottom of the piston. The pipes connecting the high-pressure and low-pressure cylinders form a low-pressure receiver.

The direct-coupled alternator is of the usual Ferranti non-inductive armature type. The armature consists of 80 Ferranti coils, made up in pairs and carried on ebonited bolts sulphured into pockets cast in the rim of the wheel, giving a very high insulation resistance. The two halves of the armature are in parallel. From the collector gear two concentric cables lead away to the switchboards, the outer of the concentric main again being connected to the low-pressure bedplate, and thus a complete earthing of all parts of the plant is insured. The field coils are of bare copper wound on edge, and the pole-pieces are capped with micaite caps molded on. The coils are magnetized from a separate exciter of 30 kilowatts, driven off a rope pulley mounted on the boss of the wheel from the high-pressure side. The switch gear is of the 500-ampere Ferranti single-pole type.

The switchboard controlling the alternators is shown in Fig. 2, and the back of the board is illustrated in Fig. 3. One of the direct-coupled Thomson-Houston generators and Willans engines is shown in Fig. 4.

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CIRCULATION, 20,000.

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It seems to be the universal law that man must make compensation in some form for every benefit received. One cannot enjoy the fruits of civilization without accepting the defects and limitations of civilization. This homely old truth must come with redoubled force to the people of Florence just at present; they have enjoyed the rose of electric transportation and now are pricked by the thorn of a street-car strike. Modern inventions make way more slowly in Italy than in the United States, but they are followed, it appears, by modern discomforts just as surely. The brief news dispatch has a very familiar sound—the men want shorter hours and more pay; the system is practically tied up; the few cars that are running are under the protection of the police. The experience has been undergone by almost every large city in this country. It is very uncomfortable for the traveling public, but with the great extension of modern transportation systems and the everlasting selfishness of the human animal, there seems to be no help for it. Strikes are in theory an economic

absurdity, but intelligent end-of-the-century workmen believe them a practical necessity to remedy wrongs, nevertheless. So that they are as much a part and symptom of present-day civilization as the electric-railway car itself. Therefore, the Florentines, in trudging through their first street-car strike, may take such comfort as they can from the reflection that if they are inconvenienced it is from an industrial ill that attacks only the modern methods of living and getting about. With a strike on the trolley lines, Florence is strictly up-to-date.

The electrical and allied interests are deeply interested in the Chicago municipal elections this spring. All parties are playing with the municipal-ownership fad, although ex-Governor Altgeld is endeavoring to make that the chief feature of the Bryan followers' campaign. Mr. Harrison very sensibly contends that the city is not in position at this time to assume ownership of the street railroads, and that until the civil-service regulations are firmly established it would be folly to attempt such an undertaking. Mr. Carter, the Republican candidate, favors civil service and municipal ownership and is opposed to the 50-year franchise scheme. Mayor Harrison's principal strength among independent voters is based on his record in the street-railway fight and his part in bringing about the defeat of the obnoxious Allen law.

Judging from the attitude of the several candidates and the platforms of their respective parties, the street-railway companies will find little favor at the city hall during the next two years, without reference to the personality of the mayor.

Promoters of the combination or trust of independent telephone companies should not lose sight of the fact that much of the success which has attended the anti-Bell movement is due to the sympathy which the public has extended in the fight against that monopoly. These interests cannot hope to sustain the same relations with the public after a consolidation has been effected, as the new combination will practically be in the same class as the Bell company, and the public will not discriminate between trusts.

Exchange managers view with alarm the proposed combination, for they recognize in it a step toward placing them directly within the power of the manufacturers. At present they have many reliable manufacturing establishments from which to purchase apparatus, and this competition has tended to keep prices within reasonable limits and at the same time to stimulate the improvement and refinement of equipment.

In spite of the inducements offered by the promoters of this trust it is admitted that several important concerns have refused to enter the combination. These companies have come to the conclusion that they will be in better position to secure business as perfectly independent companies, unhampered by the restraints and restrictions of a consolidation. They contend that if there is enough money in the industry to warrant the formation of a trust upon the terms proposed there should be larger profit in their business conducted independently under their personal management than when put in the pool.

From the present outlook, it may be said, there is no reason why the independent telephone exchange managers should feel alarmed. There will be independent telephone manufacturing companies with sufficient capacity to furnish all their demands in spite of the present attempt to consolidate these companies into a trust.

English electrical engineers have been occupied with the subject of standard frequencies for some time, and the matter has been under consideration in the engineering societies. At a recent meeting of the Institution of Electrical Engineers it was announced that the committee appointed to consider the question of uniformity in electrical engineering practice had reached a conclusion on the question of a standard frequency for alternate-current working, after having collected information and ascertained the opinions of a number of manufacturers and of consulting engineers on the continent and in America, as well as in England. As a result of these investigations the committee recommended for general purposes the adoption of a frequency of 50 periods per second, as, on the whole, the best suited

to ordinary cases of mixed distribution of alternating currents for incandescent-lamp, arc-lamp and power supply; but for the exceptional purpose of transmission of power on the large scale it recommended the standard frequency of 25 periods per second. The committee suggested for the exceptional cases of house-to-house transformer supply, as preferred in districts where the houses are scattered, a standard frequency of 100 periods per second, but this is not favorably considered. The London *Electrical Engineer* makes the following comment upon this feature of the report: "We think that the committee would have shown itself more than in touch with the profession generally if it had left out the saving clause allowing a frequency of 100 periods per second in certain districts. The very few cases in which, with a well-organized and well-supported electric-lighting undertaking, a house-to-house-transformer system is really advantageous render it useless, in our opinion, to start a special class to gain a slight efficiency in the transformers. Even then, if motors are to be considered at all, it would be better to adhere to the frequency of 50 complete periods per second." It is not improbable that an effort will be made to have this clause eliminated, although the report was unanimously recommended by the committee.

The Brundage telephone bill introduced at Springfield and passed by the lower house ought not to become a law. Good telephone service can not be furnished in a large city at \$60 a year for business telephones and \$30 a year for residence instruments. If these rates are established, as is proposed by the new bill, Chicago will be obliged to put up with a second-rate telephone service, and the Chicago Telephone company will not be able to earn a dividend on its capitalization or secure a profitable return upon its actual investment. In fact, it is pretty likely to go bankrupt should it try to operate under such rates, and we presume that even the Springfield statesmen do not aim to kill off the company entirely. It is more likely that they are poorly informed and are laboring under the misapprehension that if such rates will answer in the country they will also do for large cities. The fact that the bill was introduced by a Chicago man only makes more apparent the lack of practical information possessed by its promoters. In addition to killing off the old company the Brundage bill, should it become a law, would probably result in putting a stop to the plans of the Illinois company for building a competing exchange in Chicago. If let alone by the Legislature the new company promises to give Chicago a magnificent exchange equipped for 30,000 lines and to furnish a service at \$85 and \$45. For rates lower than these good telephone service cannot be furnished at a profit in a city the size of Chicago.

The fact that neither the Chicago Telephone company nor the Illinois Telephone and Telegraph company has interposed any serious objection to the bill is taken to indicate that these companies look upon the bill as a harmless measure. In the light of recent decision, affecting the practical confiscation of property by legislative regulations, it may be assumed that the telephone interests regard the law in its present form as invalid.

No reasonable explanation can be offered for loading the bill down with conditions that should have been the subject of another measure if, indeed, their enumeration is considered necessary and desirable. It has already been pointed out that the courts are divided upon the question as to whether telephone companies should be classed among common carriers, and one authority very significantly remarked in an opinion upon this point that the mere enactment of a law did not affect the matter at all. Such questions were to be determined logically by the conditions that prevailed, and that the courts would be governed by the facts. It would seem, therefore, that if telephone companies are not common carriers by reason of the nature of their business the Brundage bill will not affect them, and if they are common carriers there is no necessity for the formal declaration on this point contained in that measure.

Altogether, the bill may be considered ill-advised and hurtful to the independent movement rather than in the interest of honest reform of the present telephone service.

Development of Electric Power in Southern California.

(From the *Los Angeles Times*.)

This has been called the electrical age. There is no part of the world in which electricity is destined in the future to play a more pronounced part than in Southern California. The conditions which exist here make electricity almost essential to advancing civilization. Cheap fuel has been the one element most lacking as an aid to progress, and this finds a substitute in electrical power. What nature has denied in the way of fuel she has more than made up in opportunities for the development of electricity from mountain streams. In this respect the past year has seen the completion of two great systems bound to affect the industrial activity of all Southern California, while several other electrical projects are now in process of incubation.

Water power has taken on new features in the past few years, the old-fashioned water wheels which utilized the fall of water of but a few feet having been replaced by wheels which use water under pressure of hundreds of feet. The volume of water in the streams of Southern California during the summer months is not sufficient to afford any great power under the old system, but when it is confined in pipes and brought under pressure of from 400 to 700 feet and thus thrown against a wheel, the power developed is magnified almost marvelously, for there is hardly a work of man or nature which could withstand a stream of water coming from a nozzle, under a pressure of 700 feet. A pressure of 300 feet is considered about the maximum for fighting fires, and it was not until recent years that it was thought possible to confine water in pipes under a pressure of even 500 feet. The wheels in use for developing the power of the streams have cups set about their circumferences, and nozzles direct the irresistible force of water under confinement against these cups on the under side of the wheels, the water having free escapement immediately after striking the cups.

The mountain streams of Southern California frequently fall as much as 3,000 feet in the course of 10 miles. It is possible to divert the waters of these streams into artificial channels and carry them with gentle fall along the mountain side to some point where they will have a precipitous fall of hundreds of feet, down which they are conveyed in pipes terminating at the water wheels in power houses. From these houses power is transmitted to distances as great as 90 miles.

When such long-distance transmission was first suggested as a possibility in California, many experts declared it impossible of accomplishment. The Redlands Electric Light and Power company was the first to attempt it, and received much discouragement from experts. Nothing so great had ever been accomplished in any part of the world. The question of the possibility was referred to Edison, and that wizard declared his faith in the possibility of the project, basing his belief on the lack of humidity in the atmosphere of California. Water is a conductor of electricity, and in countries with humid atmosphere the project would have been impracticable. The results have demonstrated the correctness of Edison's views, and the long-distance wires work with but a trifling loss of electric fluid. As a result of its accomplishment in this direction, the Redlands plant became famous the world over among electricians, and has set the pace for the utilization of water and the development of other features of electric plants in many foreign countries, as well as through the United States. The pioneer in the development of electricity from water in California, it has been the object of study by contractors of all the other systems which have since been built up in this state.

Electrical authorities have long maintained, and still maintain, that it is impossible to generate electricity by water power economically, as all water systems are so uncertain that it is necessary to supplement them with steam plants, and the duplication of the plant robs water power of its elements of economy. Evidently this is true in countries where cheap fuel is to be had. Here, as elsewhere, it is necessary to duplicate the water plants with steam plants, for use in an emergency, though the use of the latter may extend through only a few days of each year. Experience has demonstrated that these systems can furnish power at a profit at rates based on coal at \$4 per ton, which is about half the price of coal in California. The authorities on electricity are evidently correct in their statements that water power for the development of electricity does not represent economy, if they limit their remarks to countries where coal is to be had in large quantities on the basis of coal at \$4. This state is given power at about the cost in the eastern states, where there is a cheap supply of coal, and we are thus for the first time put into a position to compete with eastern manufactures, in lines where power, but not heat, is required, while in the latter cases the supply of petroleum for fuel purposes has made great progress.

The greatest utility of electricity thus far in Southern California is in the driving of electric cars. The Los Angeles, Pasadena and Ontario systems, which in each case far surpass those of most towns of the same size, are examples of the possibilities as well as present accomplishments along the line of electricity developed by water power.

Outside of the use of power is the great value of

electrical development in the supply of lighting systems, the effect of which is seen in almost every town in Southern California of over 2,000 inhabitants.

In most cases these towns are lighted by private corporations. There are three notable exceptions to this rule, however. The Riverside and Colton municipal governments have their own distributing system, buy electricity in bulk of the Redlands company, and serve it to the individuals of the cities for either light or power purposes. Anaheim has a steam plant, owned by the municipal government, and generates an abundance of electricity for all uses, the system being one of the best in the state.

There is a utility of electricity which is characteristic to Southern California. This is its use by the farmers in pumping water for irrigation purposes. While this is a new use of it, its advantages have been thoroughly demonstrated, and it seems certain that it will be but a few years before the farming districts will be thoroughly covered by systems for this purpose. At Colton, for instance, during the last summer, the water supply has been pumped by electric power at a cost of only two cents per miner's inch for 24 hours, a cost but one-fifth as great as the average cost by gasoline engine.

It is proper to speak of the development of the past, present and future about Mill Creek, Lytle Creek and the Santa Ana River as the Redlands group of systems, as they are the direct outgrowth of the Redlands Electric Light and Power company's success, and have been projected by the same citizens of Redlands, in much the same locality, as was the parent system. This first project utilized the power of Mill Creek for the generation of electricity, which it first supplied to Redlands, then to the large ice factory of the Union Ice company at Mentone, and finally extending the system to Riverside, Colton and Highland, at which latter point it furnishes lights to the state insane asylum.

Regarding the work which has already been accomplished by this company, it is not necessary to enter into details, as the story is an old one. The company, however, is laying its plans for further development, and is acquiring lands and rights-of-way for another plant immediately above its old plant for a supplemental system, which is expected to develop 1,500 horse power to meet the demands of its increasing business.

After the completion of the Redlands system, as outlined above, the promoters of the project turned their attention to a still greater project, which had lain dormant for a number of years, though often considered as a possibility. This was the development of the power of the Santa Ana River, an undertaking which presented some great engineering problems, the river being a wicked stream after mountain storms and difficult to bring under subjection. This was finally accomplished, however, the water being turned into the canal last October. The company which accomplished this great work, under the management of the Redlands men, prominent among whom were Henry Fisher and H. H. Sinclair, was the Southern California Power company, which has become a part of the Edison Electric company of Los Angeles. The canal in which the water is diverted from the Santa Ana River has a capacity of 7,000 inches, and it extends 14,715 feet from the intake, at the junction of the river and Bear Creek, to the head of the pipes. There are two of these pressure pipes, each 30 inches in diameter, with a length of 2,200 feet and a fall of 728 feet. The power house, situated on the north bank of the river above the mouth of Kellar Creek, contains six Pelton water wheels, each of 1,200 horse power, divided into two teams, either of which, or both, can be operated at a time, affording opportunities for cleaning or repairing when necessary. From this system 4,000 horse power is being transmitted under contract with the Pasadena Electric company, the Pasadena and Los Angeles Railway company and the Los Angeles Railway company. During the construction of this plant from 300 to 400 men were employed for months. Among the materials used were 14,000 barrels of Portland cement, 350,000 feet of lumber and 4,000 poles.

Another stream which the Redlands men look forward to harnessing, and on which some work has been done, is Lytle Creek, a stream considerably smaller than the Santa Ana, but comparing favorably with Mill Creek, and the precipitancy of which offers opportunities for great pressure.

A project which has been discussed for a number of years is that of Dr. Baldwin, the site being on Mill Creek, above the plant of the Redlands system. A small force of men has been at work on this system for a number of years, and there is reason to believe that it will be completed at an early time, probably during the present year. Dr. Baldwin here contemplates putting in pressure pipes with a fall of about two thousand feet, the great power from which he expects to utilize almost wholly in pumping water at Perris, San Jacinto, Lake View and Elsinore from the large number of wells which have been developed in the past year or two. This would be of great value in the development of Southern California.

The second group of electric projects in Southern California centers about the San Gabriel River, which emerges from the mountains near Azusa. The only plant yet completed began rendering service early last summer. It is that of the San Gabriel Electric company. The plant is throughout one of the most substantial and modern to be found in this country. The electricity from this plant is brought to Los

Angeles and Pasadena, for use in all ways for which electricity is adapted, including the propelling of street cars and the lighting of houses and streets. In this city the wires of the company have been laid underground, thus avoiding the defacing the streets with more poles.

The canals of the company, used in transmitting the waters of the river to the power house, are about 30,000 feet in length, of which over 20,000 feet runs through tunnels in solid rock, the remainder being of concrete pipe and redwood-stave pipe. The tunnels are lined with concrete throughout. The water is taken finally through a hill by tunnel, from which it drops through a pressure pipe down a bluff to the power house below, the perpendicular fall being 400 feet and the length of the pipe 800 feet. This pipe is 48 inches in diameter and the lower portion is composed of steel a half inch in thickness. The capacity of the plant is 4,000 horse power. The water is directed against eight Pelton water wheels, divided into four teams, each operating independent of the others, for facility in cleaning or making repairs. Each set is capable of developing 550 horse power. From this power house the electricity is transmitted to the sub-station in Los Angeles, from which point it is distributed. The machinery of the system, both at the power house and in the city, is of the best, and embraces a number of the most modern appliances for changing voltage and transmitting electricity. The stock of this company is all held in Los Angeles.

Another project in connection with the waters of the San Gabriel River, which it was thought would be completed before this time, is that of the Los Angeles Power company, in which Redlands and Los Angeles capitalists are interested. This project looks to the development of power at a point above that of the San Gabriel company. This means the most extensive work yet undertaken in Southern California, in that it implies the gathering of the waters from many streams which unite before being used by the San Gabriel company. There would of necessity be very extensive canals for the purpose of uniting the streams at a point above that at which they unite naturally. This has raised a question of considerable importance, it being claimed that the convergence of the waters by artificial means would leave a large body of land now naturally irrigated, and on which much vegetation exists, without moisture for the preservation of plant life, and that as a consequence a large area would be denuded, to the detriment of the irrigation systems lying below the mountains. This mountain land is a part of the San Gabriel timber reservation, and the federal government has been petitioned not to grant a right-of-way for the system. Such right has not yet been acquired, which has delayed the building of the plant. The end of this matter is not yet in sight, and it may be some time before the system is completed, if it ever is to be.

Still another project connected with irrigation on the San Gabriel River is that of the Silver Lake company, composed of residents of Glendora. While this is not as large a project as the others, it is quite important. The seat of the system is above that of the Los Angeles company, and it is only proposed to utilize a portion of the tributaries of the river. This is designed more especially for local use, yet has the power of adding to the prosperity of the country near the San Gabriel Cañon. A large amount of work has been done on the plant during the past two years, but it is not known that a date has been set for its completion.

For several years there has been talk of the development of power of the Kern River and the transmission of the power by electricity to Los Angeles, a distance of 108 miles. Much work has been done on this plant, and it was thought it would be completed during the past year. Little has been heard from the project of late, and the rate of progress being made on the plant at present is not known, though it is probable that the completion of the system will not be much longer delayed. The project is a large one, rivaling anything in the southern counties. The electrical supply from this source will add materially to the possibilities of this city.

Ontario, a little city of 2,500 inhabitants, has set a hot pace in the matter of electrical development for local use, a water-power plant having been developed for the propulsion of a complete car line.

The San Antonio company of Pomona has been furnishing light for a number of years to Pomona and San Bernardino, the electricity being developed by a water-power plant with many modern features.

There are through Southern California many projects along this line, and the future will bring forth many developments, giving to all the southern counties an abundant supply of electricity to keep the country fully abreast of all demands which can be made upon it.

In Honor of Volta.

The telegraphers of Italy are soliciting funds to purchase a bronze crown to be placed at the foot of the statue of Volta. The monument of the great scientist is located in the city of Como, Italy. It is proposed to have a grand celebration in May, 1899, at Milan and Como, Italy, in honor of the 100th anniversary of Volta's discovery of the voltaic cell. The bronze crown is to be paid for by popular subscriptions of telegraphers of the world. Mr. Walter C. Burton of New York has been selected as the American delegate at the celebration.

DEVELOPMENT OF THE TELEPHONE FIELD.

Telephone Legislation in Illinois.

The question of regulating telephone charges is the subject of several bills prepared for the consideration of the Illinois Legislature, but little attention has been given them until the present. On March 16th the House passed the Brundage bill by a unanimous vote, 123 members being present and all voting in the affirmative. The bill, as originally introduced by Mr. Brundage, fixed the rental of telephones at \$85 per year for instruments in business houses and \$45 for private residences, but it was amended in the committee so as to read \$60 and \$30, and in this shape it was called up as a special order last week. From the start there seemed a practical unanimity of sentiment on both sides of the House in favor of passing the bill, and long before the end of the roll-call was reached there was no doubt but that it would go through. An important feature of the measure is the conditions it imposes upon existing companies and the declaration that telephone companies shall be considered common carriers. The text of the bill follows:

Be it enacted by the people of the state of Illinois, represented in the General Assembly, that it shall be the duty of every telephone company, or person, firm or corporation engaged in the business of leasing telephones to the public or supplying the public with telephones and telephonic service, or operating a telephone exchange, to receive and transmit without discrimination messages from and for any other company, person or persons upon payment or tender of the usual customary charges therefor; and upon payment or tender of the usual or customary charges or usual or customary rental, the amount of which shall not exceed the sum herein provided, it shall be the duty of every telephone company or person, firm or corporation engaged in the business of leasing telephones to the public or supplying the public with telephones and telephonic service, or operating a telephone exchange, to furnish without unreasonable delay, without discrimination and without any further additional charge, to the person, firm or corporation applying for the same, all the proper or necessary wires and fixtures, and the use of such telephones, wires and fixtures, as well as connections with the central office, or telephone exchange, if desired, and to connect the telephones of such person, firm or corporation with the telephone of any other person, firm or corporation having connection with the same, or a connecting exchange or central office, whenever requested so to do.

Provided, the charge, price or rental for the leasing or supplying of a telephone for use in offices, stores or other places of business, including connections, both by day and night, together with such wires, fixtures and apparatus as shall be necessary to transmit vocal messages between the patrons, subscribers or customers of any telephone company within the limits of this state, shall not exceed a rate of \$60 per annum, which charge, price or rental shall be pro rata for shorter periods, and the charge, price or rental for leasing or supplying of a telephone for use in private residences, including connections, both by day and night, together with such wires, fixtures and apparatus as shall be necessary to transmit vocal messages between the patrons, subscribers or customers of any telephone company within the limits of the state, shall not exceed a rate of \$30 per annum, which charge, price or rental shall be pro rata for shorter periods.

Provided, further, the charge or price at public or pay stations or places for local messages or conversations shall be not to exceed five cents for the first five minutes after connection is made, and if the conversations be continued beyond five minutes, five cents for each five minutes or part of five minutes thereafter.

Every company, person, firm or corporation neglecting or refusing to comply with any of the provisions of this act shall forfeit all right to transact a telephone business in this state, and may be enjoined therefrom, and from leasing telephones to the public, from supplying the public with telephones and telephonic service, and from operating a telephone exchange, by bill of complaint filed in any court of competent jurisdiction, by any person, firm or corporation injured, interested or denied of any of the rights herein given; or such company, person, firm or corporation neglecting or refusing to comply with any of the provisions of this act shall forfeit not less than \$25 nor more than \$100 for each and every day such neglect or refusal shall continue, one-half to the use of the person, firm or corporation prosecuting therefor.

In the construction of this act public telephone companies are hereby declared to be common carriers.

The fact that the Chicago Telephone company made no serious objection to the passage of the bill is looked upon as indicating that it does not fear that the measure will apply to it.

Regulating Telephone Charges.

[From the Chicago Tribune.]

The House has passed, by a unanimous vote, a bill declaring telephone companies "common carriers" and regulating their charges. Those companies are not to be allowed to charge more than \$60 a year for business and \$30 for residence telephones. At present the Chicagoan who has an instrument in his house has to pay at least \$125. The case with which this bill has gone through the lower house shows that the Chicago Telephone company has not lifted a finger to retard its progress. Evidently that company is not afraid of it. Neither is the new telephone company which the council recently allowed to do business in Chicago. The terms it promises subscribers, though lower than those of the old company, are higher than those set forth in the bill the House has passed. The new company proposes to charge \$50 for residence telephones.

If those rates which have met with the approval of the House were to be enforced the old Chicago Telephone company would not have sufficient revenue to cover its operating expenses and would have to stop doing business. The new company would abandon at once the idea of starting exchanges here. Men will not put their money into an enterprise which they know will be unprofitable and will become increasingly unprofitable as the volume of business increases.

The telephone people view with unconcern a measure which, if enforced, would ruin them, because they know that that measure, though it should receive the vote of every member of the Legislature and the signature of the governor, will be knocked in the head by the courts whenever an attempt is made to enforce it. The courts, while conceding the right of the Legislature to regulate telephone charges, will

inform the General Assembly that it has not the power to destroy the property of the telephone companies under the pretense of regulating their charges. The courts will hold that the rates prescribed by the Legislature must be "reasonable," and that rates such as those set forth in the House bill are unreasonable because they are too low.

The courts will not, while declaring the legislative rates unreasonable, attempt to make rates. To do that would be to invade the legislative domain. The court will not say that \$30 is too little, but that \$40 or \$50 will be about right. It will simply declare the entire law invalid, and the attempt to regulate telephone charges will come to a sudden end. And then some thoughtless persons, suffering from telephone exactions, will allege that the courts are "on the side of the monopolists," and berate them for declaring unconstitutional a law enacted to benefit the people.

Measures which are on the face of them impracticable are not framed or passed to benefit the people. They are passed to make the people believe the legislators are zealous guardians of their interests, when, as a matter of fact, those legislators have been shamefully derelict. The General Assembly enacts some law which most of its members know is good for nothing. The courts set it aside. The members of the Legislature say to the people, "We did the best we could, but you see what the courts have done."

The Senate has yet to pass on the House telephone bill. It should amend that measure by inserting rates which the courts will not be obliged to decide are unreasonable. It will be much better to enact no law on the subject than to enact one which cannot be enforced and thus deceive and then irritate the people.

Ohio Telephone Association.

Representatives of the independent telephone companies of Ohio met at Cleveland on March 15th to form a close association of the independent interests of the state for the purpose of co-operation and mutual protection. It is said that the association will promote a scheme for giving long-distance service, connecting Cleveland, Chicago, Cincinnati, Columbus, Toledo and a number of other cities. Eventually it is proposed to complete an arrangement with the Indiana and Michigan toll-line systems, thus effecting a comprehensive service.

The first practical step toward carrying out this plan was the signing of an agreement to connect the independent exchanges and toll lines with the United States Telephone and Telegraph company. This will give the independent movement 121 exchanges, 2,500 miles of local toll lines and 1,000 toll stations.

A permanent organization was effected under the name of the Ohio Telephone association. J. M. Thomas of Chillicothe was elected president, Kora F. Briggs of Tiffin vice-president, Edward Kibler of Newark second vice-president, A. A. Whitney of Mount Gilead third vice-president and H. D. Critchfield of Mount Vernon secretary and treasurer.

Independent Telephone Interests in Iowa.

[Special correspondence of the WESTERN ELECTRICIAN.]

The Iowa Telephone association, including the independent lines throughout the state, met recently in Des Moines in annual convention. Uniformity of rates and the connection of toll lines were the principal subjects discussed.

The following officers were elected for the coming year: President, Charles E. Wells; vice-president, G. N. Bandy; secretary, J. W. Hill; treasurer, H. E. Teachout; executive committee, D. N. Smith, Clearfield; A. A. Moore, Marshalltown; C. F. Bennett, Waterloo; W. W. Pritchard, Spirit Lake; legislative committee, Judge J. L. Stevens, Boone, and A. A. Moore, Marshalltown.

The attendance of exchange managers was encouraging, and many leading manufacturers and dealers were represented. The proposed combination of independent manufacturers was discussed informally, and the tendency toward encouraging competition was plainly marked.

The Telephone at the Paris Exposition.

According to *l'Industrie Electrique*, there will be a lack of telephonic facilities at the exposition of 1900, the prospective demand threatening to exceed the coming supply. By the present arrangement the central stations of the exposition grounds should be tributary to a central station, which hardly exists up to the present except on paper, while they are actually dependent on a central in the boulevard Saint-Germain and another in the Rue Lecourbe, both already overcrowded and insufficient for present needs. The city is possessed of a proper location in the Avenue de Saxe, and it is prepared to erect a central there to cost 1,700,000 francs. The work has been already commenced, but the authority quoted, while approving the project, calls attention to the fact that in about 14 months the exhibition will be in full blast, while in the coming fall months there will be a constant, imperative halloing from the army of constructors busy on the ground.

"It will be a perfect miracle," says that journal,

"if, with the ordinary well-known sloth of the government, the station will be in readiness for the rush. We shall wait without confidence and without hope."

Telephone News from the Northwest.

[From the Minneapolis correspondent of the WESTERN ELECTRICIAN.]

The council of Duluth, Minn., has granted a franchise for a telephone exchange to R. H. Evans of Detroit, Mich. The new company offers long-distance connection, low rates, metallic circuits and first-class service. The Bell company's franchise expired March 9th, but it continues under act of Congress applying to postroads. The new company will also apply for a franchise in Superior, but the indications point to a stormy time. Some members of the council declare that they favor a municipal exchange.

The telephone exchange at Detroit, Minn., now has 56 connections, and already an enlargement of the switchboard has been necessary.

The Wisconsin Telephone company has put in a new switchboard at Onalaska, Wis.

A local telephone company is projected at Corning, Iowa.

The Lineville (Ia.) Telephone company may extend its wires to connect with the Clinton township and Warsaw line.

The Iowa Telephone company is working to put in a telephone exchange at Montezuma, Ia.

The Greene and Western company has bought the telephone system at Clear Lake, Ia., and will make numerous extensions.

A telephone exchange is being constructed at the new town of Titonka, Ia.

The Finch Telephone company of Escanaba, Mich., is building toll lines to neighboring towns.

A local telephone exchange has been established at Mellen, Wis.

The Chequamagon Telephone company expects to have its exchange at Ashland, Wis., in operation before the end of April.

The Fairmont (Minn.) Telephone company contemplates extending its wires to Spirit Lake, Ia.

The Spirit Lake Telephone company has made connection with Sutherland, Ia., and established an exchange there.

By June 1st a new metallic-circuit telephone line will be in operation between Spokane, Wash., and Republic and Camp McKinney.

The Dakota Southern Telephone company of Woonsocket, S. D., has been incorporated with \$50,000 capital stock.

The Cedar Valley Telephone company contemplates establishing an exchange in Clarksville, Ia.

A new building will be erected for the telephone company at Algona, Ia. Chase & Achatz of Preston, Minn., have just bought the system.

The Jefferson (Ia.) Telephone company will make connection with Scranton, Ia.

A telephone exchange is projected for Northwood, Ia., if a franchise be granted.

The new telephone-exchange building is progressing toward completion in St. Paul, and on April 1st the company will issue a new directory, with the new system of calling in vogue. The calls will then be "Main," "Dale" and "Selby," followed by the number.

The Dakota Central Telephone company contemplates establishing a local exchange at Big Stone, S. D.

A telephone company has been formed at Allerton, Ia., to put in a local exchange.

The Northfield (Minn.) Chess club played a game of chess with the St. Paul Chess and Whist club by long-distance telephone. The game was an entire success, the wires working perfectly.

The Northwestern Telephone Exchange company will rebuild its exchange at Grand Forks, N. D., in the spring. Materials for the work are being received.

The Mankato (Minn.) Citizens' Telephone company has declared a three per cent. dividend out of the earnings for the quarter ended April 1st. A fund was also established to improve and extend the lines. The company has 275 instruments in use.

Assemblyman Albrecht of St. Paul proposes to have the telephone and electric wires banished from the business portion of the city. Those which cannot be put underground, he thinks, can be changed to side streets, and as soon as he determines the owners of the objectionable wires he will introduce a resolution directing their removal.

There is talk of building a telephone line from Kenosha, Wis., to Racine and other points.

The Northwestern Telephone Exchange company may erect a building for its exchange in Fargo, N. D.

J. J. Greaves of the telephone exchange in Glen-coe, Minn., contemplates extending a toll line to Lester Prairie.

The Clearfield (Ia.) Telephone company will establish connection with Afton, Ia., soon.

Arrangements have been completed for telephone connection between Winterset, New Virginia, Osceola, Woodburn, Lucas and Chariton, Ia. Work will be begun in the spring.

The Southern States Telephone company of Norfolk, Va., will issue bonds for the enlargement and extension of its system.

ANNUAL MEETINGS.

The stockholders of the Alexandria Telephone company, New Orleans, have elected seven directors to serve for the ensuing year, as follows: B. Weil, S. Warshauer, G. W. Bolton, A. Albert, Thomas Clements, J. M. Barrett, R. W. Bringham. A dividend of 10 per cent. was declared.

At the meeting of the new board of directors of the Iowa Telephone company in Davenport, Ia., the following-named officers were re-elected: President, C. E. Yost; vice-president, F. H. Griggs; secretary and treasurer, August A. Balluff, and auditor, C. A. Dalzell. President Yost told a reporter that the company would expend \$1,500,000 on improvements.

The annual meeting of the stockholders of the New Telephone company was held at Indianapolis March 9th and the following-named directors were elected: A. H. Nordyke, Louis Halloweg, W. N. Gates, L. P. Walker, M. B. Wilson, D. M. Parry, H. B. Gates, S. P. Sheerin and D. E. Parrott. The directors elected the following-named officers: President, A. H. Nordyke; vice-president, S. P. Sheerin; secretary, H. B. Gates; treasurer, M. B. Wilson.

The organization of the Green River Telephone and Telegraph company was completed in Henderson, Ky., on March 9th, to do toll-line business in that locality where independent local exchanges are in existence. Officers were elected as follows: President, J. H. Hickman, Owensboro; vice-president, O. W. Rash, Henderson; general manager, H. K. Cole, Henderson; executive committee, J. W. Carter, Owensboro; A. Waller, Henderson; J. W. Walker, Morganfield.

The sixth annual meeting of the stockholders of the Western Telephone Construction company was held at Chicago March 13th, and was characterized by the entire harmony of the stockholders present. The same board of directors was re-elected for the ensuing year, and the thanks of the stockholders were unanimously voted to the officers for the results of the year's business. The statement showed a remarkable increase in the earnings of the company and in the extension of its property, the balance-sheet showing assets of about \$200,000 in excess of its liabilities. The orders on the books were said to be greater than at any time in the history of the company, and it is working its factory night and day to catch up with orders. Within the last 30 days it has been enabled to increase its output by 50 per cent. through the addition of considerable machinery and new tools. It was announced that the company six months ago made very extensive contracts for raw materials involved in its product for the year 1899. The extent of this may be better shown by the fact that in one line of materials alone the advance in the market price amounts to nearly \$30,000. It is intimated that a considerable amount of additional cash capital has just been added to the resources of the company, enabling it to largely increase its output and place upon the market some very valuable devices which have been withheld from production until now.

MANUFACTURERS AND DEALERS.

The American Hardwood Manufacturing company of Grottoes, Va., manufacturer of telephone wood-work, has issued a new price-list which should particularly interest telephone manufacturers. This company has done business with many prominent concerns, and its facilities enable it to turn out work promptly.

A representative of the Evans Telephone company was in Duluth, Minn., lately, for the purpose of preparing the specifications of the telephone plant for West Superior under the franchise which the company holds there. Experienced solicitors are getting subscribers for telephones for the new company in West Superior.

NEW COMPANIES.

The City Council of Marshal, Ind., has granted a telephone franchise to C. W. Shmel.

The Interior Telephone company of Vienna, Ill., has been incorporated by H. De La Rue, J. W. Eaton, Jr., and C. H. Gray.

The Dakota Southern Telephone company has been incorporated in Woonsocket with a capital stock of \$50,000. The incorporators are Charles M. Hopkins, G. Dzlewanoski and Robert S. Vassar.

The Pee Dec News Transit company, N. C., has applied for a telephone charter. The company's capital stock is \$25,000 and the incorporators are W. H. Smith and J. I. Dunlop of Wadesboro, N. C., and J. L. Bundy of Rockingham.

Papers of incorporation have been issued to the Zanesville, O., Telephone and Telegraph company. The incorporators are S. M. Winn, F. H. Southard, A. T. Brennan, J. G. England and J. B. Rhodes of Zanesville, O. The capital stock is \$10,000.

The Harrison, Ky., Telephone Toll Line company has filed articles of incorporation, the incorporators being Ike C. Adair, John J. McHenry and John W. Carter. The principal place of business is Owensboro, and the capital stock is \$3,000, divided into 120 shares of \$25 each.

The Portland Telephone company of Brockton, Chautauqua County, New York, has been incorporated, to operate in Brockton, Westfield, Fredonia; capital, \$15,000; directors, S. Fred Nixon and H.

Kent of Westfield, George Frost of Buffalo and T. C. Moss, G. W. Fuller and Augustus Blood of Brockton.

The Mayville Telephone company of Mayville, Chautauqua County, New York, is a new organization, which will operate in Mayville, Westfield and Chautauqua. The capital is fixed at \$15,000. Directors have been elected as follows: S. Fred Nixon, V. A. Kent and C. J. Bannister of Westfield, C. H. Frost of Buffalo, A. T. Baldwin, C. L. Cipperly, L. B. Bixby, E. C. Fish and E. J. Griswold of Mayville.

TELEPHONE LEGISLATION.

The Assembly committee on state affairs heard arguments recently in the Wisconsin Legislature on the bills to compel long-distance telephone companies to connect with local exchanges for the transmission of messages. Henry C. Payne of the Wisconsin Telephone company contended that it would be special legislation intended to benefit a few persons at the expense of the subscribers of long-distance telephones. Mr. Payne said that for five years the Wisconsin Telephone company had paid only seven per cent. on an investment of more than \$1,200,000. The *Milwaukee Sentinel* says: "The object of these bills, as of many others presented at preceding sessions, is to enable business rivals of the Wisconsin Telephone company to use the company's property. If the bills are passed a subscriber of the rival company at Madison, for example, will be able to call up Milwaukee by means of the long-distance lines belonging to the Wisconsin Telephone company. When he is using the line subscribers of the Wisconsin Telephone company will not be able to use it. Thus there is an injustice, not only to the Wisconsin company, but to its customers. There is a widespread, and we believe a reasonable, desire to introduce competition into the telephone business. There is a general impression that this business could be conducted profitably if lower rates were charged. But the bills now before the Legislature are plainly unjust."

TELEPHONE LITIGATION.

Two suits have been started in the Circuit Court in Paterson, N. J., in consequence of the decision of the Court of Errors and Appeals, mentioned last week, declaring that telephone and telegraph poles and wires do not come under the definition of a public easement. Both are for \$2,000 and against the New York and New Jersey Telephone company. The plaintiffs allege that the telephone company erected poles and strung wires on their land in Wayne township without their consent and against their wish. The Court of Errors has decided that owners must be compensated when telephone and telegraph companies exercise their statutory privileges against the consent of the owner.

EXTENSIONS AND IMPROVEMENTS.

A telephone line will be built from Lewiston, Idaho, to Pomeroy.

The Central Union Telephone company will construct a line from Galena to Freeport, Ill.

George Grange has organized a company for the establishment of a telephone system at Alvin, Texas.

The East Radford, Va., Telephone company has been granted a franchise for the erection of a telephone system.

The American Telephone and Telegraph company has purchased 7,000,000 pounds of copper wire for extensions of the long-distance service.

The Central Union Telephone company has filed with the city clerk of Springfield, Ohio, its acceptance of the franchise allowing it to place its wires underground.

The Rocky Mountain Bell Telephone company will erect a line from Weiser to the Seven Devils, and from there to the Buffalo Hump country, according to the *Boise (Idaho) Statesman*.

The San Diego, Cal., *Tribune* says: "A subscription is now being raised for the purpose of constructing a telephone line from Banner to Julian. It is probable that the line will be commenced in a short time."

A franchise has been granted to D. C. Demarest to construct, maintain and operate a telephone and telegraph line between the towns of Jamestown, in Tuolumne County, Cal., and Altaville, in Calaveras County.

The Winthrop, Me., Telephone company wants to run its lines through that town and through Monmouth to Augusta. The Nash Telephone company wants similar rights, and both are opposed by the New England Telephone company.

The Douglas Telephone company will construct a telephone line and exchange in Lawrence County, Kan., in opposition to the Kansas-Missouri Telephone company. S. J. Bear is president of the Douglas company and J. D. Lemon secretary.

The Missouri and Kansas Telephone company will improve its toll-line service this spring. A line between Kansas City and Omaha will be established. It will have six wires, and a similar addition will be made to the Kansas City and Topeka line, while the line to Liberty will be rebuilt at a cost of \$25,000

and the service increased by the addition of four circuits.

The Massachusetts Telephone company applied on March 8th for a franchise at Lynn, Mass., agreeing not to charge more than \$3.50 for telephones in business places and \$2.50 in residences. Another petition for a telephone franchise was received from "Frank R. Marsh, trustee," and both were referred to a committee.

Among the conditions imposed in the franchise granted the Pittsburg and Allegheny Telephone company is one that the rate for business houses shall not exceed \$48 and for residences \$36; also that the company shall not sell or transfer its franchise.

S. B. Hill, manager of the Independent Telephone company at Fairmount, Ind., announces that his company will build a toll line to Matthews. The Independent Telephone company at Hartford City will also build to Matthews, joining the Fairmount company there.

The American Bell Telephone company will make improvements to its central exchange in Newport News at a cost of \$10,000. These improvements will include a new switchboard, which will have facilities for connecting 600 subscribers. The company has at present 350 subscribers.

The Cumberland Telephone and Telegraph company has completed its long-distance telephone line from New Orleans to Memphis. At an early date New Orleans will be in communication with practically all that portion of the United States east of the Mississippi River.

The local telephone company of Bath, N. Y., announces that it will make a flat rate of \$20 a year for the use of telephones for business places and \$12 a year for private residences on a three-year contract. The present rate of the Bell company is \$36 for office and \$30 for residence.

The People's Telephone company has applied to the Worcester, Mass., council for a franchise, and its application was favorably received. I. C. Currier of Worcester is at the head of the company, and it is said that the Boston and New York Telephone company is ready to back it financially.

T. S. Ingram, special agent of the Bell interests, has recently made arrangements to install a new telephone plant in Tampa, Fla. He is pushing to completion also a long-distance telephone line to connect Tampa with other important cities of Florida, and also with cities of the North, East and West.

The Bell Telephone company is soon to have a rival in Hamburg, N. Y. A new enterprise, including Jacob Peffer, John Schoepfkin, Fish & Kronenberg and H. G. Pierce, is being organized to give service in Hamburg at a much lower figure than that given by the Bell company. The local company proposes to give an all-night service at \$12 a year.

The Mount Whitney telephone system in California has been sold to the Sunset Telephone company. The Mount Whitney has offices in every town in Tulare County, and has reached far into the mountains south and east since its formation in 1844. The Sunset extended its line to Porterville, and reduced its local telephones in Visalia, Tulare and other towns from \$4 to \$1.50, to compete with the Whitney system.

The New York Telephone and Telegraph company has bought from the estate of Silas Brown the five-story brick building, 25 by 110 feet, at 14 Cortlandt street, New York, adjoining its present building, for about \$200,000. The building was badly damaged by fire a few weeks ago. It will be torn down and a 12-story addition to the company's present quarters will be erected on the site.

Springfield, Mo., has secured telephone connection with 100 towns and stations in Southwest Missouri through the Interurban Telephone company. The central office is at Greenfield, and the lines connect with Barton, Dade, Polk, Cedar, Lawrence and Greene counties, having nearly 300 miles of wire. The principal towns on this big circuit are Greenfield, Springfield, Bolivar, Humansville, Arcola, Fair Play, Dadeville, Golden City, Stockton, Lockwood, Everton and Ash Grove.

Aluminum Telephone Lines.

D. H. Fitch, manager of a telephone exchange at Cozenova, N. Y., has had some experience with aluminum wire in telephone work, and he declares that the results have been entirely satisfactory. Mr. Fitch says:

"All thus far has served its purpose splendidly. I was a little apprehensive of the last, on account of being so soft, but it has stood the storms thus far without the least impairment. The last wire put up had about 450-foot spans. The long span of nearly 600 feet has now stood through two winters and is in perfect condition—just where I put it—and has not stretched or sagged. I have an inquiry from Canada, and I have said in reply that my use of aluminum is most satisfactory, and if I had this exchange to build to-day, I would use aluminum wholly for line work."

In this connection it is interesting to note that the Pittsburg Reduction company announces that it has furnished the Bell Telephone company with aluminum conductors for foreign business, and has also furnished considerable aluminum for conductors in Japan and other foreign countries.

The "Ever Ready" Electric Light.

The cut and the title of this device explain themselves fully. The manufacturer, the American Electrical Novelty and Manufacturing company of 235 Center street, New York, offers an electric hand-lamp, consisting of lamp and battery combined, so connected that the lamp burns as long as one presses on the ring on the band. Three sizes are made, the lamps taking from 3½ to 5½ volts. The smallest outfit is 1½ inches in diameter and 8½ inches long. It will, it is said, give from 6,000 to 8,000 light flashes before the battery needs renewal. The advantages of this light in dark places, particularly out of doors, or in localities where an open flame might cause an explosion or be otherwise dangerous, are obvious.

Space Telegraphy.

A London newspaper correspondent asserts that "wireless" telegraphy has been put to a really practical test, which has proved how valuable it will be in the future saving of life at sea. "Last Saturday," says the account, which is dated March 18th, "a barkentine got ashore on the treacherous Goodwin sands, and signals of distress were fired from the south Goodwin light. These were heard on the east Goodwin lightship, where a wireless telegraphy apparatus is fixed, and by that means a message was sent to the south Foreland lighthouse, whence other messages were passed on to Kingsdown and Rams-gate for life boats. It often happens that when the

Trend of Central-station Design.

[Continued from page 170.]

from each large or interior engine. By making the end engine extra strong, so that it will carry 100 per cent. overload, which can very easily be done with slight increased cost, in case the large engine lets down you can run two generators at full capacity from the small engine until the large engine is again ready for work. This requires much less investment in plant than would otherwise be necessary to meet this emergency with independent units of power.

I have just received a report on a new magnetic clutch, three of which were designed by me for this plant, which may be of some scientific interest. These clutches are designed to transmit 1,500 horse power each and are to go between the engines and generators. These being the largest magnetic clutches I have ever attempted to design, I allowed ample reserve, and the test showed that these clutches will transmit 3,000 horse power each, with a consumption of energy of eight-tenths of an ampere at 500 volts, or less than one-half of a horse power going through the coils. The clutch is 10½ inches in diameter and carries cast-steel rings or armatures with coils in them, and by pressing a button the armatures move up to place against springs and transmit power purely by the friction of the surfaces in contact. The only energy consumed is what goes through the coil. Inasmuch as the system contemplates the bringing up of the generator arma-

The PRESIDENT: Could you use it on a jet condenser?

MR. ARNOLD: Yes; you could.

The PRESIDENT: Would it be proper to use water at a temperature of 80 or 90 degrees on a jet condenser? I should think it would require too much water to get your vacuum.

MR. ARNOLD: We are doing this right along; as, for instance, at the Englewood plant.

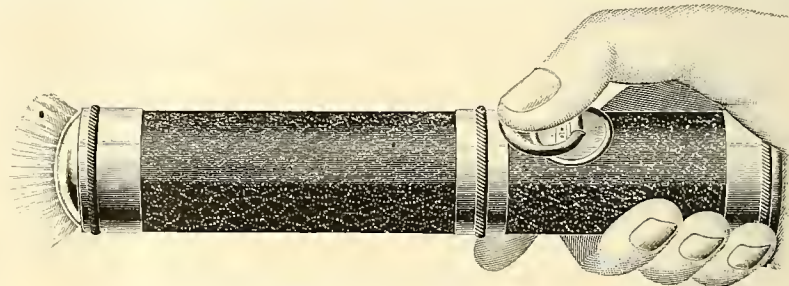
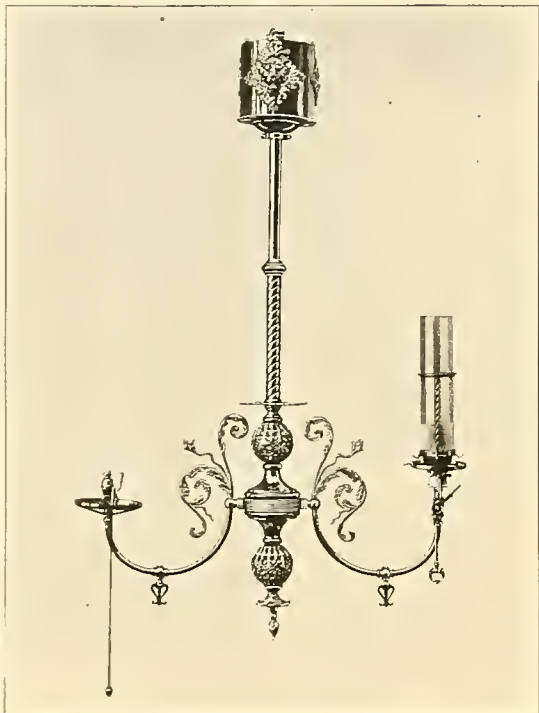
The PRESIDENT: It takes a good deal of water, doesn't it?

MR. ARNOLD: Not water, but power, for we use the same water over and over again, and add probably five per cent. to that water, as stated, to make up for loss by evaporation. I did not fully answer your question, but I will do so now. Where you can place your cooling tower on the ground it is advisable to do so and use the jet condenser, because it is cheaper to do so.

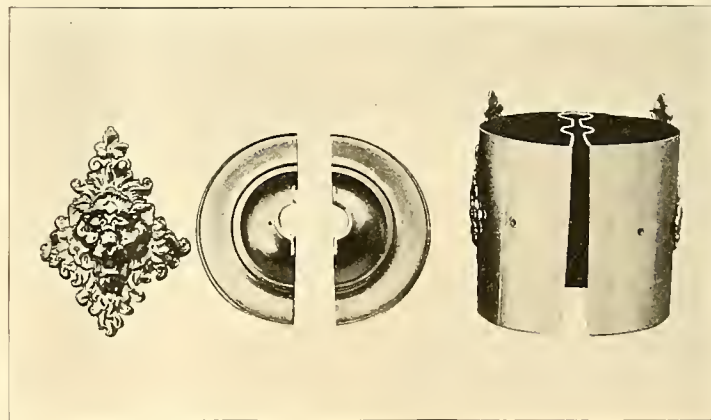
MR. HINE: I understood Mr. Arnold to say that the net efficiency of a combined synchronous motor and arc-machine outfit was something like 72 per cent., where the efficiency of the rotary converters was 90 per cent. or more. Do I understand you to say or to mean by that that there is any inherent disparity in efficiency between the synchronous motor per se and the rotary converter?

MR. ARNOLD: No; I did not mean that.

MR. HINE: Was not the apparent disparity due to the fact that the arc machine was necessarily less efficient than either of the other machines, and that the arc machine was perhaps a 75-kilowatt machine,



THE "EVER READY" ELECTRIC LIGHT.



FIGS. 1 AND 2. ADVANCE GAS LIGHTER.

wind is blowing off shore guns on lightships cannot be heard on land, and it is in such cases that wireless telegraphy will be of inestimable value in saving life. The Ramsgate town council is now pressing the Trinity House for installations of wireless telegraphy between all lightships and the shore."

In this country the Marconi system is to be thoroughly tested by the War Department at Washington. Two experimental stations have been selected, the roof of the State, War and Navy building and Fort Myer, the army post, on the west side of the Potomac, opposite Washington. The distance between these stations is six miles. The government has purchased the necessary instruments. The experiments will be conducted by Col. James Allen and Lieut. George O. Squier, both from the regular army. On the success of the experiments will depend the adoption of the system for the Signal Service.

Advance Gas Lighter.

A new electric gas lighter, made by the Advance Specialty company of 119 La Salle street (room 68), Chicago, is shown in the accompanying cuts—in position on the fixture in Fig. 1 and with the novel features in detail in Fig. 2. The characteristic feature of this gas lighter is that no wiring is required. Each fixture has its own source of electric supply in the small drum shown in the upper part of Fig. 1, and enlarged, with parts detached, in Fig. 2. The drum for the battery is made to be readily attached to the fixture in sections, and can be easily placed on fixture in use. It is shown at the right in Fig. 2, which also illustrates, in the central figure, the bottom plates of the drum, and on the left the ornament that conceals the joint of the two sections. The system is simple and cheap, and the manufacturer is confident that it will be favorably received.

ture as a motor to the same speed as the engine before it is clutched in, the two surfaces move together when running at the same velocity, and there is no grinding and no wear, and therefore the cost of maintenance should be very low.

The PRESIDENT: I would like to ask Mr. Arnold in regard to the apparatus for condensing, whether he uses a jet or a surface condenser?

MR. ARNOLD: It depends upon the location of the cooling tower. It is usually necessary when a cooling tower is used, on account of the value of real estate, to place it upon the roof of the building, and then, by all means, use a surface condenser, for by using a surface condenser you get a closed column of water; that is, the condensing water can never come in contact directly with the steam, and in that way you avoid the danger of the flooding of your engine cylinder, which is liable to happen when using a jet condenser if you had a great body of water on the roof and your jet condenser should fail.

The PRESIDENT: How many degrees can you reduce the temperature of the water in the cooling tower?

MR. ARNOLD: That depends entirely on the size of the tower and the speed at which you run the fan, which means consumption of energy. In winter this water leaves the condenser at about 100 degree Fahr. and is reduced to about 65 or 70 degrees Fahr., while in summer it leaves the condenser at about 120 degrees and is reduced to about 80 to 90 degrees. You can get it as low as the temperature outside if you use power enough on the fan, but it is not advisable to attempt to get too great a reduction of temperature in that way, because it takes too much power, so that if you get down to 80 degrees in the summer it is sufficient, because to cool the water from this temperature down the power required on the fan increases very rapidly.

and therefore naturally of lower efficiency than a large-sized rotary converter would be?

MR. ARNOLD: That is partially the explanation. The reasons for the discrepancy in the efficiency of the two machines are two, viz., the low capacity of the arc machine, and its consequent lower efficiency than the other larger machine, and the efficiency of the small synchronous motor. When we have a combined unit of that kind, a synchronous motor driving a series-arc machine, we have two small machines. Into the motor we feed the alternating current. That is simply a motor, and it has a certain efficiency, probably not over 92 per cent. It then drives mechanically an arc machine which has an efficiency of only about 80 per cent., possibly less. So that the combined efficiency of the two machines is much less than that of a rotary converter, the latter consisting of one machine, of a single armature, of a single field, the armature having a direct-current commutator on one side and three-phase collector rings on the other, the current going into one end of the armature and coming out at the other end; that is the reason that it so much more efficient.

MR. HINE: But the synchronous motor taken by itself would be just as efficient as a rotary motor of the same size, would it not?

MR. ARNOLD: Yes, sir.

MR. HINE: There is one other matter that I would like to mention. The statement was made regarding the alternating arc lamp, to the effect that as there was a deposit of ashes formed in the globe, it became necessary to clean the alternating lamp more frequently than the ordinary direct-current lamp. Is it not a fact that the alternating-current lamps burn so much longer than the direct-current lamps that they actually require less cleaning?

MR. ARNOLD: I should probably have stated in

my remarks that I was comparing the alternating arc lamp and the modern enclosed arc lamp. On that basis, I think, my remarks would be correct, but as I spoke extemporaneously I will make it clear now. Comparing the series arc lamp with the alternating, I think you are correct, because the series lamp requires attention oftener than the alternating lamp would.

Mr. KORST: Can either end of the rotary converter be used as a motor and the other part as a generator, as made to-day?

Mr. ARNOLD: You can feed the direct current into the direct-current end and take the three-phase current out of the other end, and you can feed the three-phase current into the three-phase end and take the direct current out of the other end. It is completely interchangeable in that respect.

Giant Transformers at Niagara Falls.

The Niagara Falls Power company has awarded another important contract for electrical machinery. It is for seven 2,500 horse power transformers, involving the largest units that have ever been manufactured. The transformers will be of the Westinghouse standard oil-insulated, water-cooled type. The cooling is effected by the circulation of water through coils of brass pipe immersed in the oil, so that no fans, blowers, pumps or motors will be required. This construction, therefore, eliminates any loss of power in the revolving elements of auxiliary devices.

These transformers will be of the same type and of the same general appearance as the four 850-kilo-watt transformers which were built by the Westinghouse Electric and Manufacturing company for the Cataract Power and Conduit company, and installed about a year ago in the Ohio street sub-station in Buffalo. The satisfaction given by these transformers and by others of similar design, which have been in use for several years at Niagara Falls, led to the selection of this type of transformer for the new installation in the Niagara company's power house.

The efficiency of these transformers, the Westinghouse people say, will be remarkably high. At full load it will be considerably over 98 per cent., at half load over 98 per cent. and at quarter load over 97 per cent.

At present these transformers will be used in stepping-up the two-phase, 2,200-volt current from the generators to three-phase, 4,400-volt current for supplying the Union Carbide company. They may also be used in stepping-up to 11,000 and 22,000 volts, three-phase, these being the voltages used in transmitting the power to Buffalo, or they may be employed as reducing transformers, lowering from 11,000 or 22,000 volts, three-phase, to 2,200 or 4,400 volts, two-phase or three-phase.

It is interesting to note the growth of the Westinghouse company's oil-transformer business, the total output of which for the seven years ended December, 1898, was 146,540 horse power. In 1898 about 90,000 horse power was installed.

CORRESPONDENCE.

New York Notes.

NEW YORK, March 20.—Such has been the absorption and consolidation and interlacing of electrical companies in New York and Philadelphia by a single group of capitalists that some people are beginning to think that the Whitney syndicate will soon have a predominating influence in everything electrical in this part of the country. Things have not reached that stage yet; but the statement that the Metropolitan Street Railway company will install \$3,000,000 worth of storage batteries directs attention again to the far-reaching extent of the operations of Mr. Whitney and his associates. The statement that the value of storage batteries to be put into the Metropolitan plant is \$3,000,000 may not be exact, but the order is certainly a very large one—the largest the Electric Storage Battery company ever received. Now Mr. Whitney and his business friends are in control of the Metropolitan company and also of the Electric Storage Battery company, without much doubt. They also own the New York Gas and Electric Light, Heat and Power company, formed to consolidate the lighting and power companies of this city, and are back of large electric-vehicle and electric-boat interests. It is believed that the storage batteries that have been ordered are to be used to enable the syndicate to operate all these interests in conjunction, with a steady load on the generating plants, and therefore more economically. The scheme is of the first magnitude, but all the steps taken by the syndicate so far seem to tend in the direction of its consummation.

On Wednesday of last week the Assembly at Albany, after a three hours' debate, passed the bill giving the Astoria Light, Heat and Power company authority to build a tunnel beneath the East River and to condemn land, if necessary, in Astoria for the purpose of running gas mains from works it contemplates building there to the tunnel. The intent of this bill is declared to be to concentrate in Astoria the works of the Consolidated Gas company, now in New York. On the same day Senator Fells-worth introduced a bill which some persons think is a companion measure to the Astoria bill. Others think it has an intimate relation to the great scheme of the capitalists of New York who seem to be attempting to unite all the electrical companies of New

York into one company. It provides that any company which manufactures electricity may also manufacture steam and place its pipes in the streets, with the consent of the local authorities.

The Assembly cities committee has reported favorably the New York city rapid-transit bill, with the amendments asked by Alexander E. Orr, president of the Rapid Transit Commission. Mr. Orr said that the bill was needed to give the Rapid Transit Commission authority to have an underground rapid-transit system built by private capital if city money could not be secured. The commissioners were unanimous in their opinion that the system should be built by city capital, but city money had not been available owing to the constitutional debt limit being nearly reached and for various other reasons. The commissioners intended to continue to seek city capital, but if they were unable to get it they did not want the construction of a rapid-transit system held up for an indefinite length of time. The amended bill has not been opposed so far by the Tammany authorities, which is rather surprising, in view of the previous attitude of Mr. Croker and Mayor Van Wyck.

I noticed among the incorporations at Albany last week that of the McGraw Publishing company of New York. The capital of the new company is placed at \$400,000, and the directors are E. E. Higgins and J. Aspinwall Hodge, Jr., of New York and C. E. Whittlesey of Madison, N. J. A good guess would be that this company is formed to take over the business of all of Mr. McGraw's publications—the *Street Railway Journal*, *Electrical World* and *Electrical Engineer* and the *American Electrician*.

The United Gas Improvement company of Philadelphia, which already controls the Yonkers gas plant, as well as gas plants in many other cities in the country, including Philadelphia, proposes to branch out farther in Westchester County. It will, it is said, take in the following-named electric-light companies: East Chester Electric company, which is operating electric-light plants at Mount Vernon, New Rochelle, East Chester and Pelham; Port Chester Electric Light company, operating plants at Port Chester and Rye; Larchmont Electric company, operating plants at Larchmont, Mamaroneck and New Rochelle, and the White Plains Gas and Electric company, operating at White Plains. M. S.

PERSONAL.

T. W. Ness, representing the Holtzer-Cabot Electric company of Boston, was in Chicago last week.

W. D. Packard of the New York and Ohio company of Warren, Ohio, passed through New York on Tuesday of last week en route for Europe. Mr. Packard expects to remain in foreign parts several months, and will make a combined business and pleasure trip.

John G. Milburn, a prominent lawyer of Buffalo, has been elected president of the Pan-American Exposition company. In accepting the position Mr. Milburn said that he believed the real purpose of the exposition should be an educational one, and that the merely "show" features should not predominate.

Mr. L. K. Cushing, the secretary of the Illinois Electric company of Chicago, has been afflicted by the loss of his wife, who died at the family residence on March 14th. Mrs. Cushing, who was but 25 years of age, was well known in South Side society and left many friends to mourn the departure of a charming personality. Electrical men in Chicago and elsewhere will sincerely sympathize with Mr. Cushing in his bereavement.

A complimentary dinner was given in Liverpool, England, on March 4th, to Prof. Oliver J. Lodge, B.Sc., F.R.S., in recognition of his having received the Rumford medal, which is awarded every other year by the Royal Society for the most important discoveries in heat and light. The company included Sir William Crookes, Sir John T. Brunner, Bart., Prof. Rucker, Prof. Fitzgerald, Principal Glazebrook, Prof. Hele Shaw and Mr. A. Bromley Holmes.

Mr. E. J. Spencer is the chairman of the committee of electrical men of St. Louis which has been appointed to solicit stock subscriptions from electrical manufacturers and business men for the exposition to be held in St. Louis in 1903 to celebrate the centennial of the Louisiana purchase. The project contemplates a stock company with a capital of \$5,000,000. In all, by subscriptions, loans and appropriations, it is proposed to raise \$17,500,000. The electrical industry will be benefited by the fair, it is said, and is therefore urged to contribute. Mr. Spencer's address is 24 Laclade building, St. Louis.

ELECTRIC LIGHTING.

The city of Louisburg, N. C., is in the market for a complete electric-light plant.

A franchise has been granted to Chicago men for the establishment of a complete system of water-works, electric lights and telephones at Wills Point, Texas.

A San Diego, Cal., paper says that E. C. Sharpe of San Francisco has arrived in San Diego and will probably put in a bid for installing an electric-light plant. Two years ago he offered to build it for

\$48,000, but now he says he could not build it for less than \$60,000, owing to the advancement in the prices of material.

The city of Rosland, B. C., has been authorized to borrow \$150,000 for the purpose of procuring light and water plants.

The contract for reconstructing the building of the Citizens' Light and Power company of Houston, Texas, has been awarded. It is said that the new plant will cost \$150,000.

Citizens of Ferris, Cal., have organized for the purpose of securing a water plant and an electric-light plant. It is believed that an electric plant can be installed for \$10,000.

The Consolidated Electric Light and Power company of Birmingham, Ala., is preparing to make extensive improvements and additions to its plant and will extend its lines to all the suburban points.

An ordinance has been accepted in Redwood City, Cal., calling for the construction of a system of electric-light works to be owned and maintained by the town. D. R. Stafford is the town clerk.

The committee appointed by the trustees of Ukiah, Cal., to investigate the question of an electric-light plant (municipal) recommends that the town be bonded for \$18,000 to raise money to erect the plant.

Robert Morrill is installing an electric-light plant at Nelson, Wash., and is pushing the work with vigor. The power house will be built on Deep Creek, and power will be transmitted over the mountains by wires.

It is intended to make an especial feature of the electrical illumination of the streets and business blocks of Chicago at the coming autumn celebration, of which Chicago Day (October 9th) will be the distinguishing date.

Sealed proposals will be received until April 1st for furnishing materials and constructing an incandescent electric-lighting plant in Palo Alto, Cal., in accordance with plans and specifications on file with the town clerk. The bids are to be addressed to H. W. Simkins, clerk.

The Peninsula Electric Light and Power company of Newport News, Va., is engaged in making improvements to its plant to cost \$30,000. The new apparatus includes one 400 horse power engine, four incandescent-light dynamos with capacity of 1,000 lights each and an ice plant of 10 tons a day capacity.

The Houma (La.) Lighting and Ice Manufacturing company has closed a contract for the erection of an electric-light plant of 1,000-light capacity for furnishing lights and power to the city. The plant will be operated in connection with the company's ice factory, the capacity of which will be increased to 12 tons a day.

An application has been made to the council of Napa, Cal., for a franchise for 50 years to construct and operate systems of poles, wires, etc., for electric-light and power lines in Napa City. The council proposes to grant the franchise, and will meet on April 17th, at 7:30 p. m., and open and read all bids therefor. H. H. Thompson is city clerk.

The United States Treasury Department is inviting sealed proposals, until March 28th, for the installation of a system of conduits and wiring for electric lighting in the United States courthouse and post-office building at Kansas City, Mo. Plans and specifications can be had upon application to O. L. Spaulding, assistant secretary of the Treasury, Washington, D. C.

The electric-light plant at Belleair, Fla., has been enlarged and placed in first-class order, and is now considered the finest electric plant of its size in the South. It has recently been supplied with duplicate machinery, so that if any part of the equipment breaks or gets out of order the other can be brought into service in a few minutes. The plant has a capacity of 3,000 lights.

In 1898 the gross station earnings of the Edison Electric Illuminating company of New York were \$2,868,026. The net income was \$1,277,129, from which were paid interest and dividends amounting to \$867,743, leaving a surplus of \$409,386. The net income was over \$150,000 greater than in 1897. The installations in connection with the service of the company approximate nearly 1,000,000 16 candle power lamps, and the maximum output of the Edison stations exceeded on December 22d 112,000 amperes.

The commissioner of Indian affairs is inviting sealed proposals until March 27th for furnishing the necessary materials and labor required to construct and complete an electric-light system at the United States Indian school at Santa Fe, N. M., in accordance with plans and specifications to be seen at the United States Indian warehouse, No. 1602 State street, Chicago, Ill. Any additional information can be obtained upon application to A. H. Viets, superintendent of the school.

A short time ago the sheriff sold at public sale the Rutherford, N. J., electric-light plant, under foreclosure proceedings instituted by the Franklin Trust company of New York, which held a mortgage of \$37,000 on the plant. The bidding was brisk during the early part of the sale, but it narrowed down

to Mr. Copeland, counsel for the electric company, and Mr. Levan, for the Franklin Trust company. Mr. Copeland bid to \$60,950 and quit. Mr. Levan went \$50 better and obtained the plant.

The directors of the North Hudson Light, Heat and Power company, which enjoys a monopoly of furnishing electricity for lighting purposes and motive power in Hoboken, N. J., and the North Hudson towns, has decided to expend \$250,000 to improve and enlarge the plant in Hoboken. The company is also considering the advisability of placing all its wires underground. The promoters of the North River Light, Heat and Power company, which was organized several weeks ago for the purpose of competing with the old company in Hoboken and vicinity, are said to be not meeting with much success in their efforts to secure franchises in the different towns.

The electric-lighting plant recently installed by L. N. Fowler for Austin Kimball of Clearwater, Fla., for lighting his residence, is one of the most complete and efficient private plants in the South. The generator is a 4½-kilowatt C. & C. machine, and the current is conveyed from the power house, 200 feet from the residence, by a lead-encased underground cable. There are 65 lamps of 16 candle power each connected in the residence. There are distributing boards on the first and second floors of the building, and all wires are run through brass-covered conduits, and each circuit is separately fused. The motive power of this plant is a Hornsby-Akroyd oil engine.

ELECTRIC RAILWAYS.

An electric railroad is to be built to connect Portland, Ore., to Oregon City.

The San Diego (Cal.), Pacific Beach and La Jolla Railway company has given up the idea of electrically operating its road.

Work has been begun on the Tacoma-Seattle electric-railway line. Franklin Riffle of Victoria will have charge of the work.

Papers have been filed with the secretary of state of New Jersey increasing the capital stock of the Havana Electric Railway company from \$5,000,000 to \$10,000,000.

Blackall & Baldwin, 39 Cortlandt street, New York, have postponed the time for receiving bids for building the 23 miles of electric trams in Shanghai from March 15th until June 30th.

It is understood that the Glenwood Street Railway company has purchased the Arlington Heights railroad of Fort Worth, Texas, and contemplates making a number of important improvements on it.

An electric street-car line is to be erected for Kern and Bakersfield, Cal., to cost about \$60,000. Money is on hand for the enterprise. Work will be commenced as soon as preliminaries are arranged.

It is reported that an electric railway will be built, starting at The Dalles, Ore., and following the Columbia River and tributaries to a point near Gooseberry, thence running to Hardman, which place will be the end of the road.

The commissioners of Cook County, Ill., have passed an ordinance granting the Northern Electric Railway company a 20-year franchise, that will carry one of the projected lines from Chicago to Elgin as far as the limits of River Grove.

The War Department has given to the Westinghouse company a contract for building an electric railroad at the Indian Head proving grounds. A commission decided that this would be the best way to avoid danger of fire.

The Southwest Missouri Electric Railway company is reported to be contemplating the erection of a large power plant in Galena, Kan. This would indicate the possibility of an extension of this admirable system to some point farther south.

On March 20th Alderman Bennett introduced an order in the Chicago City Council providing that the receiver of the Calumet electric railroad be compelled to operate cars in St. Lawrence avenue, between Seventy-first and Seventh-fifth streets, on tracks now unused.

Henry Elling of Dillon, Mont., is said to be contemplating the construction of an electric railway from the terminal of the Gaylord and Ruby Valley road at Twin Bridge, up the Ruby Valley, to some convenient point, probably the mouth of Alder Gulch, near Laurin, and possibly Virginia City.

The Freeport General Electric company of Freeport, Ill., has passed into the hands of a receiver. Judge Groscup entered the order on the application of several complainants, who alleged that the company is insolvent and unable to pay the \$78,500 bonds held by it. William O. Johnson of Chicago is named a receiver.

An amended ordinance granting to A. F. Burleigh, W. Smith and A. Stone a franchise to build a street railway upon the same streets now occupied by the trolley way cable line has been adopted by the council of Seattle, Wash. The present cable line will be abandoned and reconstructed with double trolley to be operated by electricity.

Hon. Thomas Forster, C. E. Tisdall and others had an interview recently with the provincial government of British Columbia, in which they urged the

construction of an electric railway from Vancouver to Steveston at the mouth of the Fraser River, and thence up the river, to secure all the available trade from canneries and farmers. The cost of the enterprise is estimated at \$145,000. Mr. Tisdall is taking a leading part in the matter.

There is about to be built in San José the first electric railroad in Costa Rica. H. T. Purdy, chief engineer, is in charge of the work, and D. M. Anderson of Washington, D. C., is first assistant to him. The company that is building this road is the Costa Rica Electric Light and Transportation company of San José. The material for the line is now practically all in that country.

The Niagara Falls and Suspension Bridge Railway company has applied to the Common Council of Niagara Falls for permission to extend its tracks through several of the streets of that city. If the right is granted the company will extend its tracks outside of the city to the north on Sugar street to Lewiston avenue, and then south on Lewiston avenue to connect with the Whirlpool and Northern tracks, thus making a new belt line in the northern section of the city.

It is said that arrangements have been completed whereby the suburban trains of the Evanston branch of the Chicago, Milwaukee and St. Paul railroad will be run downtown in Chicago from Sheridan Park on the Northwestern elevated railway, now building, and thus around the Union loop. This plan will make necessary the electrical equipment of the cars of the Chicago, Milwaukee and St. Paul Railroad company employed in this service and an inclined connection at Sheridan Park.

A call has been issued for a meeting of the stockholders of the Redlands (Cal.) Street Railway company, to be held May 25th. This is because the subscriptions to the proposed issue of bonds are such as to encourage the hope that the balance needed before any further steps are taken will be subscribed by that time. If the subscription is completed by the date of the meeting, the bonds will be issued promptly, and the work of changing the road to an electric line will be begun immediately.

The new Indianapolis Street Railway company has presented a proposition to the city. The company offers to pave between the tracks, expend in the extension and improvement of its plants, cars and lines of street railway all sums that shall be necessary, to pay the city the sum of \$750,000 in installments, carry passengers for a fare of five cents for a single ride with suitable transfer privileges and sell six tickets for 25 cents and 25 tickets for one dollar. In return the company asks a 34-year franchise.

Early in the month the Cleveland (O.) and Warren Electric Railway company was incorporated, with a capital stock of \$10,000, with the right to increase the capital to a larger amount. Among the incorporators are Hon. Martin Dodge, C. B. Lockwood, J. E. Phelps of Chagrin Falls, C. E. Thorp, Maysmills, and J. B. Corlett. The intention of the company is to build a line, 50 miles long, passing through the counties of Cuyahoga, Geauga, Portage and Trumbull. The temporary officers are: President, J. W. Conger; general manager, Martin Dodge.

The New Orleans City Railroad company has been incorporated as the reorganized New Orleans City and Lake Railroad company. The capital stock of the new company is \$7,500,000, of which \$2,500,000 is preferred and \$5,000,000 common stock. The old company had been a part of the New Orleans Traction company, which, with its constituent companies, is now being reorganized. The new board of directors and officers of the new company are: Albert Baldwin, J. C. Denis, F. T. Howard, C. H. Hyams, R. E. Craig, J. B. Levert, A. B. Wheeler, J. C. Russell, R. M. Walmsley. Mr. Walmsley is president and Mr. Baldwin vice-president.

The Tarrytown, White Plains and Mamaroneck Railway company has secured a franchise from Highway Commissioner John T. Creavy to construct its lines through the town of East Chester as a part of its proposed extension from White Plains to Mount Vernon, N. Y. The franchise is for 99 years, and the company must have cars running in six months. Another applicant was the New York, Westchester and Connecticut Traction company. The traction company has purchased the North Mount Vernon railroad, which, it asserts, has a franchise from Mount Vernon to White Plains, and President Boland said that if the commissioner decided against his company the fight would be carried into the courts.

The Tennis Construction company of Philadelphia has been awarded the contract for building the 40 miles of road for the Cincinnati, Lawrenceburg and Aurora Electric Street Railway company. The latter company was incorporated last November, with a capital stock of \$10,000, which has since been increased. There will be two power houses, each equipped with two 500 horse power Hamilton-Corliss engines, two 400-kilowatt Westinghouse generators and four 250 horse power tubular boilers. Besides building the road and the power houses, the contract requires the Tennis company to furnish the rolling stock. J. C. Hooven, Hamilton, O., George H. Helvey and Fred D. Shaefer are among those interested in the company. The Hamilton county commissioners have granted a franchise and right-of-way for 25 years from Anderson's Ferry to the Indiana state line.

TECHNICAL SCHOOLS.

Fire started by an explosion in the mechanical hall of West Virginia University at Morgantown, W. Va., early in the month, burned the building to the ground. The loss was \$52,000.

The senior class of the Massachusetts Institute of Technology recently made two tests, each of 88 hours' duration, on the battery of boilers in the engineering boiler house. During the first test three boilers were run; in the second test the two new boilers only. It happened that the second test was made during extremely cold weather, and the two boilers were run at the rate of 255 horse power, this being about 80 horse power above rating. The students were divided into squads of four, each squad working eight hours. Particular attention was given to the analysis of fine gases, and the fire was regulated in accordance with the results of the different analyses.

ELECTRICAL SECURITIES.

The American Bell Telephone company has declared a quarterly dividend of three per cent., payable April 15th.

On March 15th \$950,000 worth of 30-year, five per cent. gold first-mortgage bonds of the Niagara Falls and Lewiston railroad, better known as the Niagara Gorge road, were sold at auction in New York. They brought 50 cents on the dollar. They are due in June, 1925. The bonds were held as security by the Equitable Life Assurance society for a note for \$760,000.

INDUSTRIAL COMBINATIONS.

The street railways and electric-lighting companies of Easton, Pa., have been purchased by Stern & Silverman of Philadelphia, Pa. The various companies will be consolidated.

The *Chicago Record* asserts that a combination of manufacturers of gas and electric-light fixtures is being formed, with a capital of \$6,000,000 6 per cent. cumulative preferred and \$9,000,000 common stock.

A dispatch from Washington to the *Newark Advertiser* says: "Ex-Senator James Smith, Jr., has, it is reliably reported, secured an option on the gas and electric-light plants of the District of Columbia, and will consolidate them in one big trust. It is understood that he is backed by millions in local capital and the United Gas and Improvement company of Philadelphia."

The International Traction company is the name taken by the big syndicate that has purchased the electric roads in Buffalo, Niagara Falls and vicinity. It has been incorporated under the laws of New Jersey with a capital stock of \$15,000,000. Benjamin W. Franklin of New Jersey is the president, and C. McVeagh secretary. This organization is believed to be temporary, the expectation being that Hon. W. Caryl Ely will be the president in the permanent organization. Of the capital stock \$5,000,000 is preferred and \$10,000,000 common. The preferred is to bear 4 per cent. cumulative dividends.

Consolidation of the electric and cable street-railway lines of Denver was effected recently under the name of the Denver City Tramway company. Articles of incorporation were filed. The capital stock is \$5,000,000. The directors are Rodney Curtis, G. E. Ross-Lewin, James H. Blood, Samuel N. Perry, Dr. W. F. Accleman, Charles B. Whitehead, William N. Byers, Charles F. Musgrove and William G. Evans. The officers are: President, Rodney Curtis; vice-president, W. N. Byers; treasurer, G. E. Ross-Lewin. The cable lines will be changed to electric, provided the consent of the city can be obtained, and other extensive improvements will be made.

Some interesting figures about the rush of incorporations of new companies under the laws of New Jersey are given by a Trenton correspondent of the *New York Tribune*. The records of the secretary of state for the month of February show that it has been the greatest in the history of this state in the incorporation of large trusts and companies, and, as New Jersey leads all the other states in the number of incorporations, these records indicate that the combination of large industries and the organization of companies with enormous capital have been greater in the United States in the last month than ever before. In the last three months the amount of money received by the state in fees for incorporating companies under its laws exceeds the amount received in the whole 12 months preceding. The sum of \$71,631.96 was received in February for fees, and will be turned over to the state controller for deposit in the state treasury. January comes second, with \$68,830.50. To show how rapid has been the increase of incorporations formed under the New Jersey laws, the amounts of the state fees since October 1, 1898, the first month of the fiscal year, are given as follows: October, \$5,645; November, \$11,704.72; December, \$46,312.81; January, \$68,830.50; February, \$71,631.96; total, \$204,124.99. These figures show only the fees paid on the filing of the articles of incorporation, and do not include the receipts from the tax on corporations. The total amount received by the state in fees for the filing of certificates of incorporation in the last fiscal year was only \$164,000. If the average rate of incorporating of the last five months continues until the end of the present fiscal year, the state will receive nearly \$500,000, or about three times as much as last year, in fees for incorporating these concerns."

MISCELLANEOUS.

The 353-foot chimney, with 22-foot core, which has just been completed at the Ninety-sixth street station of the Metropolitan Street Railway company, New York, is said to be the largest in the world and the tallest on the continent. This stack gives draft to a 70,000 horse power station.

The United Pneumatic Fire Alarm Telegraph company, with a capital of \$100,000, has been incorporated in Trenton, N. J. The incorporators are Michael C. Bouvier, Albert Goldstein and Max Radt of New York, Bernard M. Irving of Wyckoff, N. J., and John Bouvier of Nutley, N. J.

The Bureau of Yards and Docks of the Navy Department is inviting sealed proposals, until April 8, 1899, for enlarging the existing three-wire, 220-volt, electric-light and power plant at the Norfolk, Va., navy yard. The specifications call for two boilers, one feed-water heater, one feed pump, two electric generating sets, one switchboard, two steam separators, two injector condensers and two steam condenser pumps. There will be four compound-wound, direct-current, constant-potential dynamos. Specifications and blank forms of proposal will be furnished intending bidders upon application to Mordecai T. Endicott, chief of the bureau, Washington, D. C.

The Chicago Edison company has secured the contract for wiring the new *Evening Star* building in Washington, D. C. The work includes the wiring for about 1,400 16 candle power lights and for 250 horse power in motors; also bell-signal system, telephone wiring and telegraph piping. It is to be done in iron-armored interior conduits. The contract also includes a very elaborate switchboard, with cable connections to storage battery. The switchboard has three dynamo panels of 75 kilowatts each, besides the various feeder panels for the lighting and power feeders. The building is to be located on Pennsylvania avenue, opposite the new postoffice building. It will be 10 stories high. The general contract was awarded to the George A. Fuller company of Chicago, which sub-let the electrical construction to the Chicago Edison company.

The Philadelphia exposition of manufactures suitable for export, which will be held in September, October and November, will furnish manufacturers of electrical machinery and appliances with an excellent opportunity of meeting the representative business men of Australia and neighboring colonies and exchanging views with them, that may result in opening up valuable trade connections. The second International Commercial Congress of the leading commercial men in the chief cities of the world will meet in Philadelphia during the progress of the exposition, and the visitors will naturally devote considerable time to an examination of American goods. The delegation from the Australian colonies will be a full and representative one. The display of electrical material is expected to form one of the leading features of the exposition.

A Rochester dispatch to the New York *Sun* relates that Frederick Owen of Pittsburg, representative of the Westinghouse Electric and Manufacturing company, who has had charge of establishing the electric-lighting plant recently contracted for by the village of Charlotte, met a severe accident at the power house of the plant. Mr. Owen was working on a large Westinghouse alternating-current generator when his arm came in contact with a live wire, and 1,500 volts passed through his body. The strength and path of the current are not stated. The man was thrown twenty feet and narrowly escaped being caught in the flywheel of the engine. When picked up he was unconscious. His fellow-workmen carried him out of the building, stripped him and laid his body on the wet ground. He began to revive, and in half an hour was conscious. The next morning he was able to be up, and in the afternoon he was apparently entirely recovered from the shock. It was noticed, however, that during a severe electric storm that prevailed at Charlotte on the day after the accident Mr. Owen suffered again the pains that racked his body while lying on the wet ground outside of the power house.

TRADE NEWS.

A New York financial publication makes the rather startling assertion that the General Electric

company does about 85 per cent. of all the electrical business in this country.

William W. Northcott, purchasing agent for the city of Victoria, B. C., will receive bids for arc-light carbons and globes until April 4th at 4 p. m.

The Knapp Electric and Novelty company of New York is removing its office and factory from 47 Warren street to 125 White street, where its facilities will be doubled.

The Martin J. Insull company of Chicago has been incorporated with \$6,000 capital by A. H. Reece, G. E. C. Johnson and Robert L. Elliott. The new company will be closely associated with the General Incandescent Arc Light company of New York and will deal in enclosed arc lamps, switches, sockets and other electrical specialties.

One of the busiest concerns on John street, New York, is the Standard Paint company. Purchasing Agent Vandewater recently stated to a representative of the *WESTERN ELECTRICIAN* that the company was literally overwhelmed with business. Outside of the electrical business, as is well known, the Standard Paint company does an enormous general trade. And when it is realized that the company's electrical department, handling a very large amount of insulated tape, compound, etc., is but a branch of this flourishing establishment, the present condition is easily understood.

The Smith & Hemenway company of 20 Warren street, New York, has purchased of the Malby-Henley company of the same city the latter's entire hardware business, good-will, trademarks, etc., and also all unfilled orders for hardware. The new company will take pleasure in receiving and executing all orders on goods of this nature formerly manufactured and sold by the old concern. Among other things the Smith & Hemenway company deals in Swedish carbons for all purposes. The Malby-Henley company will still continue business, devoting its entire attention hereafter to the silver-plated ware and kindred lines and steel-tin spoon branch of its business.

When a company receives daily unsolicited, testimonial letters from those using its product there must certainly be some merit in the article used. The Crescent Chemical company, Chicago, is one of the concerns thus pleasantly situated; it is constantly receiving the strongest kind of testimonials from electric-lighting companies using its Never Slip pulley covering. This covering is used all over the country, and is said to be giving the best of satisfaction. It is a liquid, is inexpensive and is absolutely guaranteed. The Crescent company will send a supply of its covering on 30 days' trial, and if not entirely satisfactory the sample may be returned at the company's expense.

The Western Electrical Supply company of St. Louis, Mo., has made arrangements with the Emerson Electric Manufacturing company for the sale of the latter's motors for this season. The long-established reputation which the Emerson company has enjoyed, due to its efforts to maintain a strictly high-grade product, has been demonstrated by the results obtained in the past. The Emerson '99 model electric fan, among other improvements, has an entirely different blade from the one formerly used, having a tendency to cut the wind without causing the incessant buzzing of most desk fans. The Western Electrical Supply company is in an excellent position to make prompt shipment of these fans and anticipates a very large fan-motor business this season. It is also again introducing its well-known Paragon fan, which met with much success last season. The Paragon fan is made only for direct current, whereas the Emerson is made for the alternating current. These two fans make a good combination and place the company in a position to supply the wants of prospective purchasers, irrespective of the current they are using. The new type Paragon ceiling fan promises flattering returns for the coming season, and will probably meet with general approval. The Western Electrical Supply company will take pleasure in making prices on both types of fans, in either alternating or direct current, for desk, bracket or ceiling types, on application.

BUSINESS.

W. C. Sterling & Son, Monroe, Mich., have a large stock of cedar poles for telephone, electric-light and street-railway lines and call the attention of electrical men to their prices and facilities for

prompt shipment. They also supply ties for railway work, cross-arms and pins.

Henry C. Adams, Jr., secretary of the Phillips Insulated Wire company of Pawtucket, R. I., is just starting on the western trip which he makes about this time of the year. His business is in excellent condition, as is shown by the fact that the new double factory is running full blast.

The Petite arc lamp of the Western Electric company is made in a number of different styles, so that it is suitable for use under different conditions. It is suitable for street-railway plants, power circuits and isolated plants. A handsomely illustrated catalogue of this lamp is sent on application to the company at Chicago or New York.

The Lombard Water-wheel Governor company has received an order for three additional type "B" governors for the plant of the St. Anthony Falls Water Power company of Minneapolis. These governors are for the three additional units of four Victor turbines each, which are now to be installed. This will make in all 10 Lombard governors in the plant, regulating 40 water wheels.

For a man that never had an idle moment to spare in the usual routine of business, it is not to be wondered that Capt. F. S. DeRonde of the Standard Paint company now finds the day short. Soon after his recovery from camp fever, contracted during the war, Capt. DeRonde made a western trip and was welcomed by many of his old friends. But his return to New York, after his protracted absence, finds him in the position of the man who wishes every day had 48 hours.

The Jandus Electric company has recently placed on the market a continuous globe enclosed arc lamp, 25 inches in length, which is attracting much attention. The method of trimming is ingenious, and is said to be the quickest yet devised. Ready accessibility to the lamp mechanism is another good feature. The western trade will be supplied with information, catalogues, etc., by addressing the company at 753 Monadsnock building, Chicago.

The Bryant bracket weatherproof socket, which is, it is claimed, an absolute weatherproof socket supplied with a brass cap, with either 1/2-inch or 3/4-inch thread, is an article which has been looked for for some time, and will undoubtedly find a large demand. This socket also has the advantage of being grooved to take a special 2 1/2-inch shade-holder, which is an advantage which has not been generally possessed by weatherproof sockets heretofore. The Electric Appliance company is carrying a large stock of these sockets.

Charles H. Besly & Co., 10 and 12 North Canal street, Chicago, Ill., report that they are very busy in the tap and die department at their factory, Beloit, Wis. They are making many shipments of their new Badger non-adjustable die stock, which cuts the same size every time and full thread at one cut. These die stocks are made complete in the bicycle sizes, as well as in the machine-screw and regular bolt sizes. Recent shipments of taps and dies have been made to Rockford, Milwaukee, Rock Island, Moline, Pullman, South Chicago, Joliet, Omaha, London, Lima, Rio de Janeiro and other points.

The many friends throughout the western and southwestern states of W. N. Matthews, who was so long identified with the success of the St. Louis Electric Supply company of St. Louis, Mo., are watching with interest his new venture. Mr. Matthews is at present handling a large line of second-hand electric and steam machinery, with headquarters at 312 Commercial building, St. Louis. This machinery is all in first-class condition, and is only for sale in consequence of its having been discarded through the consolidation of several small plants into a large plant, and also through the change from overhead to an underground system. In a word, although nominally "second-hand" machinery, this lot is considered practically as good as new. Mr. Matthews' present plan is to further prosecute the business of handling second-hand electrical machinery. With his enviable reputation for square and straightforward dealing and his long experience in the supply business among the central-station people of his section, it is safe to say that he has only to continue this business to make it a success. Mr. Matthews is at present in New York, where he has secured several valuable agencies for his territory.

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued March 14, 1899.

620,900. Means for Lighting Fountains, etc. August Engelsmann, Stuttgart, Germany. Application filed December 11, 1897.

Features of this arrangement include the drum, the colored glass and light therein, the U-shaped rim on the upper edge of the drum, and the drum cover having a glass and having a flange extending down into the channel formed by the U-shaped rim, so as to leave an air space for the passage of air to and from the interior of the drum.

620,907. Trolley Ear. Henry Geisenhoner, Schenectady, N. Y. Application filed August 5, 1898.

The trolley wire has grooves, a trolley ear has lugs, and a wire laid in the grooves and passing around the lugs secures the ear and trolley wire together.

620,930. Circuit Breaker. Thomas J. Johnston, Schenectady, N. Y. Application filed October 19, 1898.

This circuit breaker comprises a switch, a trip, an electromagnet and armature for opening the trip, and a device for altering by steps or aliquot portions the pull necessary to actuate the armature and trip and open the switch.

620,965. Alternating-current Motor. Edwin W. Rice, Jr., Swampscott, and Charles P. Steinmetz, Lynn, Mass. Application filed July 29, 1893.

The motor includes an inducing or primary element, comprising coils or sets of coils connected in series and angularly displaced so as to have different axes of mag-

netization, an adjustable resistance connected in multiple with one of the coils or sets of coils whereby the magnitude and phase of the current therein may be varied, and a secondary or induced element in inductive relation to the primary coils as set forth.

620,966. Induction Motor. Edwin W. Rice, Jr., and Charles P. Steinmetz, Schenectady, N. Y. Original application filed July 29, 1893. Divided and this application filed October 16, 1897.

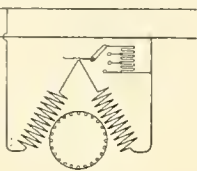
Claim is made for the combination with single-phase mains of an alternating current motor containing three angularly displaced windings, one of which receives current by inductive action from the other two, and all of which receive energy derived from the single-phase mains, and means for shunting one winding by a device adapted to shift the phase of current in the winding.

620,986. Frequency Changer. Charles P. Steinmetz, Schenectady, N. Y. Application filed January 31, 1895.

A frequency changer is composed of two dynamo-electric machines of the rotary-field type, connections being made from one of the machines to a supply system, and from the frequency changer to a secondary system, and means provided whereby the speed of one of the machines is so modified by the action of the other that the currents induced in its secondary member, and fed therefrom to the secondary system, are of a definite frequency different from the frequency of the currents in the supply system.

620,987. Frequency Changer. Charles P. Steinmetz, Schenectady, N. Y. Application filed January 31, 1895.

The method of changing the frequency of alternating-current circuits or systems consists in supplying currents of given frequency to the primary of an induction or transformer motor maintained in rotation at a speed different from that corresponding to the frequency of the supplied currents, feeding one circuit with currents induced in the secondary of the motor, and a second circuit with currents generated in a generator mechanically coupled with the motor, and representing the mechanical energy consumed by the motor.



NO. 620,965.

620,988. Self-starting Alternating-current Motor. Charles P. Steinmetz and Ernst J. Berg, Schenectady, N. Y. Application filed September 10, 1895.

An alternating-current motor has exciting windings connected directly to the supply mains of the system, phase-modifying devices consisting of a device having capacity and a device having inductance, connected across the mains in parallel to the first-named exciting windings, and other exciting windings connected to the first-named exciting windings at an intermediate point, and connected at their free end to a point between the device having capacity and the device having inductance.

620,989. Starting Device for Electric Motors. Charles P. Steinmetz and Ernst J. Berg, Schenectady, N. Y. Application filed January 26, 1897.

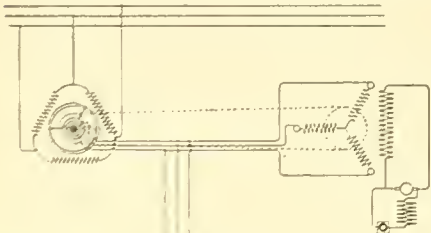
In a single-phase alternating-current system of distribution it is proposed to use an alternating-current motor having main and supplemental inducing windings, the main windings being directly connected to the supply lines in parallel to the first-named exciting windings, and the supplemental inducing windings to the supply lines, one of the phase-modifying devices consisting of a phase-advancing device in the secondary circuit of a step-up transformer.

620,990. Frequency Changer. Charles P. Steinmetz, Schenectady, N. Y. Application filed January 30, 1895. Renewed February 5, 1897.

The combination is claimed of a transformer or induction motor and a synchronous generator geared to run in unison therewith, with a source of alternating currents of given frequency supplied to the primary of the motor and a circuit for supplying current to translating devices connected in multiple with the generator terminals and with the secondary of the motor.

620,996. Electric Arc Lamp. Joseph T. Tsachieret, Levallois-Perret, France. Application filed May 9, 1898.

The claim is reproduced: An arc lamp comprising two rigidly connected frame plates, sheaves revoluble in bearings secured to the upper plate, a guide rod depending from the upper plate, tubular guides arranged diametrically opposite each other respectively rising and depending from the lower plate, a tubular carbon holder working in the tubular guide riser from the lower plate and on the guide rod depending from the upper plate, a carbon holder working in the tubular guide depending from the lower plate, a flexible connection passing over the aforesaid sheaves and connecting said carbon holders, which latter are provided at their lower ends with a horizontal arm projecting toward each other to hold the carbons in the vertical axial plane of the frame or substantially so, in combination with a solenoid, its core or armature, the lever pivoted to said core and terminating in a sleeve through which one of the carbon holders passes, the spring, means substantially such as described for limiting the movement of the lever in one direction, suitable electrical connections connecting the carbon holders with a supply circuit, and a shut circuit including the solenoid.



NO. 620,990.

620,997. Self-acting Annunciator-indicator. Francis C. Van Dyck, Jr., New Brunswick, N. J. Application filed March 20, 1897.

A horizontal series of vertically movable indicators, each provided with a hook having a beveled face, and a transversely disposed screw retaining rod for all the hooks provided with a beveled face, a second horizontal series of annular magnets in a different horizontal plane from the first series, provided with similar hooks, a similar transversely disposed retaining rod for the hooks, and operative connections between the transversely disposed bars for insuring their simultaneous movement.

620,998. Electrical Device Involving Hierarchically Insulated Conductors. Nathaniel G. Warth, Indianapolis, Ind. Application filed December 7, 1897.

In an electric cable there is an impermeable and hermetically sealed sheath containing fibrous insulating

material and rarefied air, which latter in part forms the dielectric for the conductors when the cable is in use.

621,005. Electric Meter. William S. Weston, Chicago, Ill. Application filed July 1, 1898.

This meter consists of an electric motor having an alternating or to-and-fro rotative movement, a pole changer adapted to reverse the torque of the motor after it has passed the center of movement, and a registering train for recording the total movement of the motor.

621,008. Electric Storage Cell. Chaimsonovitz P. Ellicson, London, England. Application filed May 9, 1898.

A plate for an electric accumulator comprises a series of parallel perforated and corrugated plates, the corrugations of one plate being arranged at an angle to those of the adjacent plates, the exterior plates being formed of one piece bent to surround the interior plates and having its ends secured together and rivets of the same material as the plates uniting the same, the several plates being united by autogenous soldering.

621,080. Underground Electric-railway System and Traveling Collector Therefor. Nestor Henquin, Schenectady, N. Y. Application filed March 8, 1898.

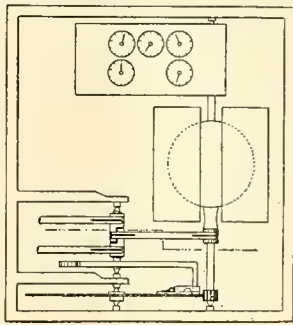
A conduit of the character described and a collector consisting of a yoke, wheels journaled upon the yoke, the wheels having a conducting center and insulated sides, conductors leading from the axles of the wheels, a housing secured to the under side of the car, copper plates fitted within the housing, and means for maintaining the collector in its proper relation to the housing are described.

621,084. Method of Applying Preservative Coatings to Objects or Structures of Iron or Steel. Henry L. Hollis, Chicago, Ill. Application filed April 20, 1898.

The method of applying a preservative coating to iron objects consists in subjecting the iron object to be treated to an oxidizing reagent, passing a current of electricity from the object through the oxidizing reagent to furnish oxidizing conditions at the surface of the iron object and cause the union of oxygen with the iron, and subjecting the coated iron object to an annealing temperature.

621,093. Fire-alarm Box. James W. Johnson, Chicago, Ill. Application filed December 7, 1896.

The first claim is given: In a signaling apparatus the combination of a starting device, motor mechanism responsive to the starting device, a signaling device adapted to be operatively connected with said motor mechanism, a signal-arresting device, a motor-stopping device independent of the length of time the motor is in operation and normally held to an inoperative position, but adapted to be rendered operative in response to abnormal conditions.



NO. 621,005.

621,104. Electric and Combined Electric and Gas Chandelier or Bracket. Willy H. Lau, Chicago, Ill. Application filed June 6, 1898.

A combined electric and gas distributor comprises a gas distributor, rings of non-electric conducting material surrounding the gas distributor, such rings having grooves therein forming holes through which gas arms can be inserted to be secured in the gas distributor, metal plates, one of such plates having lugs extending peripherally of the rings, bolts extending through the metal plates and the rings and securing the plates and rings rigidly together, and a bracket secured to the electric distributor in combination with gas arms secured to the combined electric and gas distributor by being extended through holes in the electric distributor and into the gas distributor, and electric arms secured to the combined electric and gas distributor by extending into the peripheral lugs.

621,126. Electrical Switchboard Signal. William E. McCormick, Chicago, Ill. Application filed January 11, 1898.

The combination is made in a switchboard casing having a series of openings arranged one above another in the front thereof and doors or shutters for closing the openings, of means—such as an incandescent electric lamp—located within the casing near the front thereof for illuminating the interior of the same, a series of frames having shelves in the rear and open spaces at the front thereof, so that rays of light can pass therethrough, the frames being arranged one above another within the casing and in the rear of the openings through the front thereof, electromagnets on the shelves, and an armature for each magnet adapted to engage and operate a shutter corresponding thereto.

621,150. Process of Manufacturing Active Compositions for Secondary and Primary Battery Elements. Alexander Schanschiff, London, England. Application filed January 3, 1898.

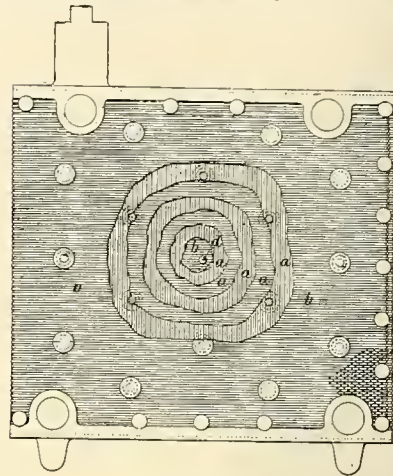
A process for the production of active material compound for battery elements consisting in intimately mixing finely powdered carbon with formic acid, tartaric acid and sulphuric acid, when the mixture has cooled adding the active material and when cooled making the mixture into a dough-like paste, with sulphuric acid solution, whereby the paste after it has dried and been "formed" is in a highly porous condition and has its pores filled with highly porous gas absorbent and conductive matter.

622,295. Automatic System for Preventing Collisions on Electric Railways. Charles F. Bancroft, Lowell, Mass. Application filed November 3, 1898.

The combination is shown in an electric railway of a feed wire, a trolley line, provided with turnouts, having in each branch an insulated section, and means whereby the moving of a trolley or equivalent device over one branch of one of the turnouts will render the insulated section of the opposite branch of the next turnout in advance dead and prevent an approaching car from passing over the last-named turnout.

621,210. Apparatus for Supporting Electric Wires and Automatically Cutting off Current on Breakage of Same. Ralph Bostock and Frank A. Cheetham, Brighouse, England. Application filed November 29, 1898.

In apparatus for supporting electric wires, there is a frame, a block capable of sliding in same, and insulated therefrom a shield pivoted at one end and below the frame and adapted to make contact with the wire carrying the current, means for normally connecting the shield and block and means for withdrawing the block and thereby disconnecting it from the shield when the wire is broken, so that the shield may fall by its own weight.



NO. 621,048.

621,241. Electrical Controller. Nathan K. Garhart, Indianapolis, Ind. Application filed August 8, 1898.

An electrical controller includes a suitable frame, a horizontally rotatable lever adapted to be actuated by the foot, a horizontal rod rotatably mounted in the lever with an upturned end that engages the frame when the rod is oscillated, and a pedal piece secured to such rod for oscillating it.

621,263. Electric Switch. Andrew E. Maccoun, Braddock, Pa. Application filed March 28, 1898.

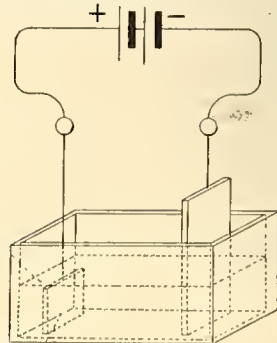
An electric switch is described comprising a rotatory drum having a series of conducting sections laterally insulated from each other, a bar to which the current is led, the bar having electrically connected conducting fingers arranged to bear upon the sections and split up the current, and another bar having electrically connected fingers arranged to bear upon the sections and collect the split-up current.

621,267. Magnetic Lifting Device. Ambrose Monell, Homestead, Pa. Application filed May 12, 1898.

In a magnetic carrying device there is a series of electromagnets, the lifting power of the series being proportioned to lift the heaviest weight desired, and each individual magnet being proportioned so that the magnetic lines between its poles will be practically completed through the smallest thickness of article to which it is applied, means for energizing and de-energizing the magnets, and an equalizing support for the magnets arranged to distribute the lifting strain equally among them.

621,291. Electric Incandescent Lamp. Francis M. F. Cazin, Hoboken, N. J. Application filed October 29, 1895.

In an electric incandescent lamp there is a luminous body which consists of two cohesive parts, of which a linear, uniformly sectioned, continuous filament of suitable material and section is the one, or inner part, and sheets or webs or pseudo fabrics, made of rare metal oxide, as their main substance, form the other or outer part, which two parts are adhering to one another.



NO. 621,084.

621,292. Electric Incandescent Vacuum Lamp. Francis M. F. Cazin, Hoboken, N. J. Application filed October 15, 1897.

An electric incandescent vacuum lamp, having an extra glass housing, surrounding the inner air-exhausted glass bulb and leaving space between the inner and outer glass walls, and having a part of the inner bulb projecting through the housing into the surrounding atmosphere.

REISSUE.

11,724. Electric Vehicle. Karsten Knudsen, Chicago, Ill. Application filed December 16, 1898. Original number 613,420, dated November 1, 1898.

A vehicle frame comprising a rear axle is described, upwardly extending brackets mounted thereon, a pair of longitudinal tubes secured in the brackets, a cross piece, an electric motor frame journaled to the rear axle and resiliently suspended from the cross piece, a cross piece joining the longitudinal tubes at the forward end of the frame, a center bracket upon which the cross piece is supported, tubes extending laterally from the center piece, each carrying brackets upon the ends, and a pair of axles mounted upon the brackets to rotate about vertical axes.

Western Electrician

EVERY SATURDAY.

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No. 13

An Electrical Sawmill.

A sawmill built from the ground up for electrical operation is still a novelty, rapid as has been the introduction of electric power for factory driving. Such a plant is to be found in Chicago, however, in the large establishment of the Edwin S. Hartwell Lumber company on Elston avenue, near Humboldt boulevard. The yards extend along the north branch of the Chicago River, opposite the Deering harvester works, and are of large extent and traversed by special tracks of the Chicago and Northwestern railroad. The manufacturing plant is new and consists of a planing mill and saw-sheds. The power house (Fig. 2, page 182) is placed between them. Power from a 500 horse power engine is transmitted mechanically to the planing mill and electrically to the saw-sheds. In the latter every machine is driven by an electric motor, and the whole sawmill was designed and arranged for electrical operation.

Five tubular boilers (Fig. 3) of 100 nominal horse power each constitute the steam-raising equipment. Shavings and sawdust are burned as fuel under them in external furnaces or Dutch ovens. This fuel is collected in the planing mill and saw-sheds by two steel-plate exhausters and delivered to a cyclone head on the roof of the planing mill. From this receptacle the shavings are fed through pipes to the furnaces. The galvanized-iron chutes used for this purpose are plainly shown in Fig. 3. The boilers have suspension settings. The breeching leads to a self-supporting steel-plate stack, 110 feet high above foundation and having a 60-inch flue. The top of the foundation for the stack is two feet above the boiler-room floor, and the breeching enters

room and supplies current to the motors in the saw-sheds. The shaft has two friction clutches—one attached to the pulley driving the dynamo and the other, a friction-clutch cut-off coupling, connecting the long shaft in the planing mill.

Fig. 4 (page 183) shows the power generator and switchboard. The dynamo is a Westinghouse, 250-volt, 225-kilowatt, multipolar machine. The switchboard is of white marble, with Wagner instruments and Bergmann switches. There is a separate switch for each of the six circuits leading from the board, whether light or power, and provision is made for extension. Lightning arresters are being placed on all outdoor circuits. A 110-volt lighting dynamo, driven by its own engine, is to be installed, but in the meantime all lights in the mills, both arc and incandescent, are run on the 220-volt circuits, with

types of saws, an exhauster and groups of machines. Four of the motors, of 15, 25, 30 and 50 horse power each, are multipolar; the others are bipolar. Each motor is elevated on a platform, and, with the exception noted, enclosed in a room or large box of its own, with door and window, starting apparatus and fuses. The wiring is all open and is well done.

Exceptionally good service has been given by this plant, and Mr. Hartwell is well pleased with the electrical system. It enables the machinery to be arranged in any position desired, without reference to line shafts, and is economical of power, as there is no idle shafting to be driven when one group of machines has ceased work for lack of material or other cause. The electrical plant is to be extended to the installation of more enclosed arc lamps throughout the yards and the erection of an electric hoist at the wharf on the river, to be used in unloading lumber barges.

When the sawmill motors were first put into service some of them were installed temporarily, as the machines to be driven were not in their permanent positions. In consequence several of the machines were compelled to carry overloads, and this afforded opportunity for some interesting tests, which were made by Mr. S. G. Neiler of Pierce & Richardson, the consulting mechanical and electrical engineers for the plant. Under the running conditions, it was found that a 20 horse power motor driving a resaw ran for three consecutive days with 76 per cent. overload. This machine behaved admirably, there being an entire absence of sparking at the brushes. Two of the eight horse power motors were run continuously for over

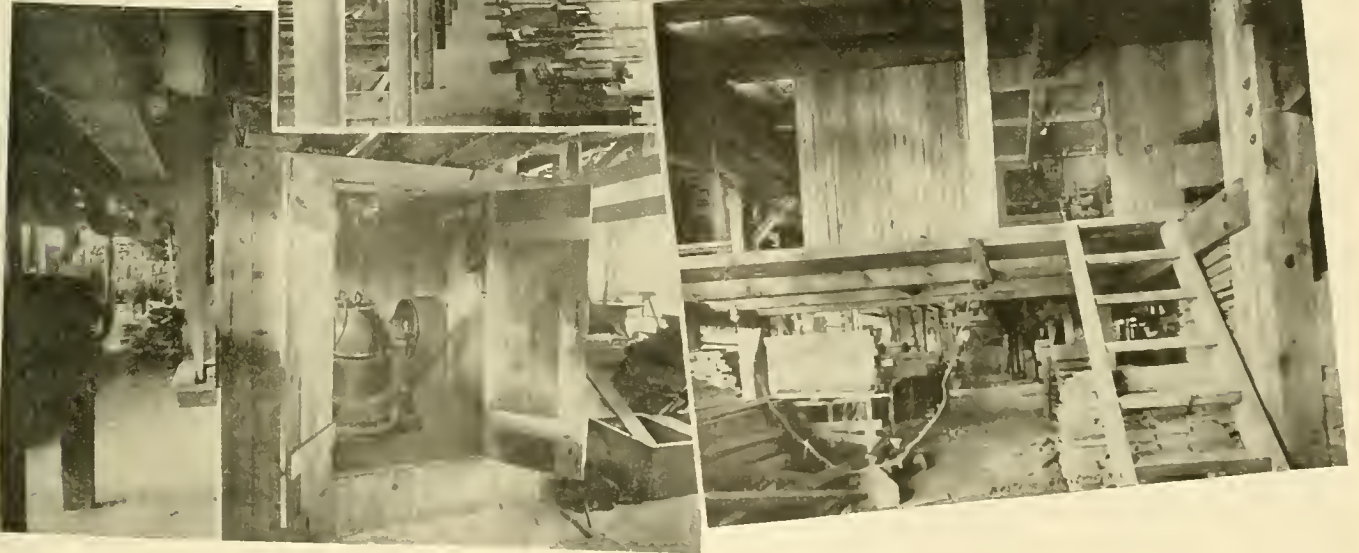
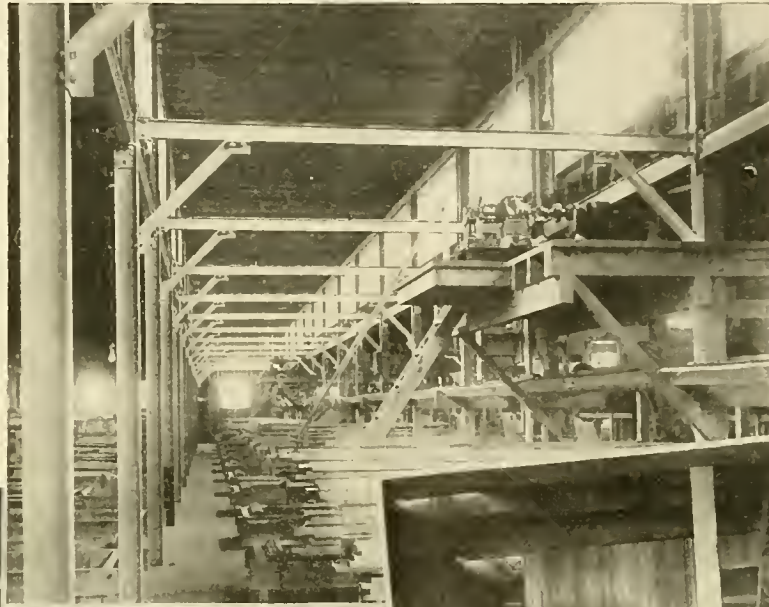


FIG. 1. AN ELECTRICAL SAWMILL.—A FEW OF THE MOTORS.

the chimney at a height of 10½ feet above the foundation. The stack is lined throughout, above the breeching, with curved firebrick, and there is an opening in the base to make easy the removal of soot.

The engine that operates the power plant has a single cylinder 30 by 48 inches and turns at 70 revolutions per minute. It was built by Filer & Stowell, and has a heavy-duty frame and a specially built-up flywheel 22 feet in diameter and weighing 55,000 pounds. It is now running non-condensing, but is fitted with double eccentrics, permitting a better distribution of steam and thus increasing the economy at full load. It is usually run at 90 pounds steam pressure, and then gives an output of about 500 horse power, but at 100 pounds pressure and at the latest point of cut-off it has a capacity of 800 horse power.

The engine drives an elevated jack-shaft, supported by extra heavy standards. This shaft extends into the adjacent planing mill and drives all the machinery there. To it, also, is belted the electric power generator, which is located in the engine

room and supplies current to the motors in the saw-sheds. The planing mill and saw-sheds are well lighted, many of the lamps being attached to pendant lamp-cords, so that all parts of the machines may be supplied with ample illumination. The switchboard is arranged so that when the new dynamo is installed the lights can be easily carried on separate 110-volt circuits. Then the lighting and power outfits will be independent and may be run separately.

In the saw-sheds there are 19 220-volt Holtzer-Cabot motors, ranging from five to 50 horse power in capacity. They are all belted machines, and, with the exception of the two placed on balconies in the second story of the building and shown in the upper view in Fig. 1, they are all completely housed in, as indicated in the lower picture in the group. There are four motors of five horse power each, four of eight horse power, three of 10 horse power, three of 15 horse power, one of 20 horse power, two of 25 horse power, one of 30 horse power and one of 50 horse power—in all, 19 motors with a combined capacity of 277 horse power. The smaller motors drive elevators and conveyors; the larger ones conveyors, various

two weeks with a 30 per cent. overload. The 50 horse power motor, which was installed to run a group of machines, was obliged to carry an overload of 40 per cent., as one of the steel-plate exhausters was connected to the shafting. This machine carried this overload for a week, at the end of which time a motor was installed for driving the exhauster. The 30 horse power motor was subjected for an entire day to an overload of no less than 100 per cent. The machine behaved very well indeed under this excessive overload, neither the armature nor the fields becoming overheated and there being very little trouble at the commutator. Under no condition was there any injurious sparking. The small eight horse power motors ran along with their overload exceptionally well for such small machines. One in particular, which was driving a saw, was experimented with. It was found that when ripping one-inch boards at the highest speed 34 amperes was required. This is 10 per cent. overload. With two saws on the same shaft, making two cuts in one-inch board, 56 amperes was required, the machine under these conditions carrying an overload of about

87 per cent. With one saw cutting two-inch board, the motor required 60 amperes, which was 100 per cent. overload. The latter experiment was made to determine whether a change could be made and a larger saw put in the outside saw-shed, but as this machine when operating under normal load required just eight horse power no change in the saw was made.

These tests again demonstrate the endurance and flexibility of the electric motor and its peculiar adaptability for factory use.

Electric Street Lighting.¹

By ALBERT SHEIBLE.

The efforts made toward street lighting by that early electrical student, Benjamin Franklin, make it particularly fitting that our streets should be lighted electrically. And when we consider how readily we can supply electrical energy to lamps distributed over wide areas, how a given amount of gas will produce nearly three times as much light when used to run a gas-engine dynamo supplying incandescents as when consumed in fish-tail burners, and how we can easily support our electric lights in positions and under conditions that would bar out both oil and gas lamps, we may well expect lighting by electricity to closely approach the ideals of street lighting and to most fully meet its prime objects. This it has done sufficiently to hold its own for nearly a score of years, yet we can hardly say that the average electric street-lighting installation has made the most of its possibilities. The reasons for this will be more plain when we look back over the last score of years and trace the causes which have molded electric street lighting into the present common forms.

Street lighting, as a whole, had become quite common for large cities before the advent of electric-lighting practice; indeed, Pompeii had its street lamps, and even the use of gas for street lights dates back almost to the time when Davy discovered the electric arc. Paris was lighted with gas as early as 1817, while Berlin and Dresden followed nine and 10 years later, so that the extended street lighting of large cities from a central point had passed the experimental period more than half a century before the days of electric lighting. What is more, our larger cities 20 years ago seemed to be well aware of the two prime objects of street lighting, namely, path finding and crime preventing. They wanted to give the pedestrian enough light to see others approaching him and to avoid his stumbling over irregularities in the sidewalks or streets. They endeavored to give enough light at the crossings for teamsters to see holes or obstructions in the roadway, and they knew that the highwaymen would be greatly handicapped by the lighting of the dark nooks and alleys which formerly harbored them. Had the incandescent lamp come first it probably would have been immediately set to work at helping

went up immediately for electric street lamps, powerful street lamps, dazzling street lamps. Mr. Brush himself likes to tell of the first electric street lighting in this country, when a dozen tower lamps were placed on the Public Square at Cleveland, and when many in the crowds that gathered brought dark spectacles with them! It was not so much the illumination that they were watching for, but rather the dazzle, the glare; and having once seen these



FIG. 2. AN ELECTRICAL SAWMILL.—POWER HOUSE

dazzling lights and noted the intense illumination near them, the people were not satisfied with anything less brilliant, so that high candle power of lighting units became a requisite of lamps for street lighting.

The result was twofold; first, the cost of the high candle-power lamps made it necessary to get along with a much smaller number of lighting units than had formerly been used; and, secondly, the impression made on the general public by these intense lamps led to emphasizing the show or display feature. These new factors have been affecting street lighting ever since, and besides influencing the trend of

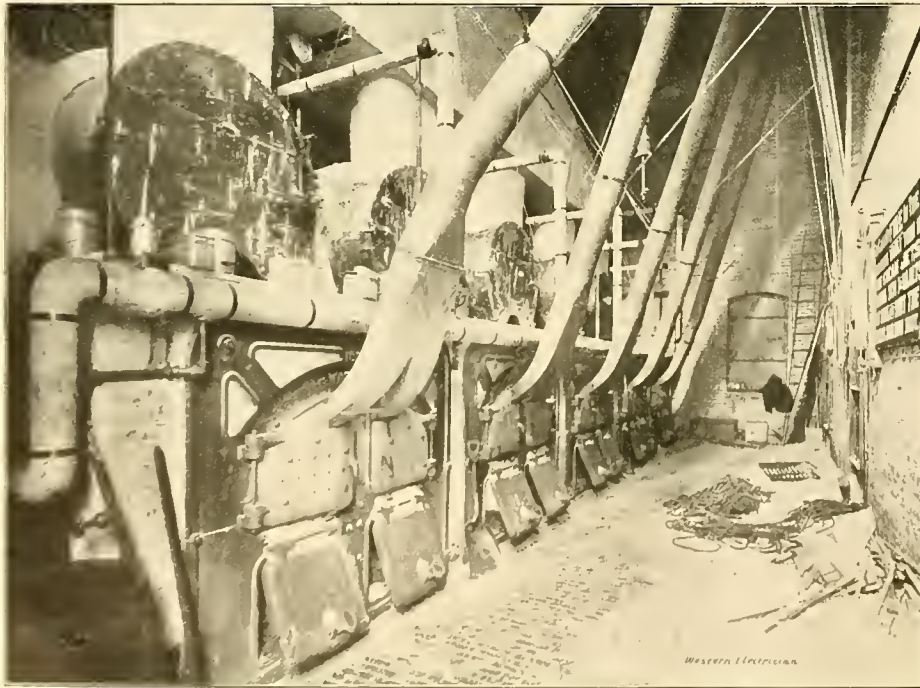


FIG. 3. AN ELECTRICAL SAWMILL.—BOILER ROOM, SHOWING CHUTES CONVEYING SHAVINGS TO FURNACES.

street lighting to more readily fulfill these two prime objects.

But it was the arc lamp that came first here and the Jablochkoff candle in Europe. Both of these were lamps of high candle power, and in admiring their great brilliancy, the people forgot the formerly well-known objects of street lighting. Wherever the arc lamp or the Jablochkoff candle was shown, the high candle power made the old gas or naphtha lamps seem very dim and ineffective; hence the cry

street lighting, they have done a great deal toward introducing electric-light systems into towns which otherwise might still be without them. This very show feature appeals to the pride of the citizens of the average town, when electric lights are proposed for use on their streets, so that even to-day we can find items like this in the local papers: "If we can get a telephone system and electric lights, this will indeed be the metropolis of the county." No doubt, the presence of a good street-lighting system and the show created on the business streets by an intensely bright lighting during the evening have drawn

trade toward towns thus lighted; and happily so, for there are hundreds and hundreds of cities in this country that have been blessed with electric-lighting and power circuits for years that even now would not have them were it not for the encouragement given to the proposed lighting company in the shape of a city lighting contract.

The rapidity with which electric lights were introduced has shown a very marked effect on the character of the devices used in connection with them. In the early days the many problems connected with the successful building of the generators, regulators, lamps and switches left the makers no time for paying proper attention to the means for supporting the lamps, for protecting them from the weather or for reflecting the light so as to distribute it over a wide area. Nor were the purchasers particular; almost any sort of arrangement would do if ready in time. The result was immediately seen in the crudeness of many of the street-lighting devices brought out at that time, and, unfortunately, a large share of those still on the market are merely copies of these early examples. Even to-day the number of manufacturers who have made a real study of the needs in this line is very, very small, and naturally so, as the devices represent quite a small part of the cost of a plant. These few have already done much toward equipping both new and old plants with a better class of devices, and can do more just in proportion to the support given them by electrical engineers, city officials and the general public.

Having taken this glimpse at the causes that have molded street lighting in the past and are still molding it, let us now look briefly at some of the changes due partly to the general progress in electrical work and partly to these peculiar influences.

As for the lamps themselves, electric street lighting has, for the most part, been done with just the same types of arc lamps that have been used indoors, the works of the arc lamp being somewhat protected from the weather by means of a sheet-iron hood over it. Only within the last half-dozen years have there been lamps with a proper weatherproof casing so as not to need this hood. The so-called 2,000 candle power (460 watt) and 1,200 candle power (300 watt) arc lamps are used almost entirely, though here and there we find some smaller sizes, which I believe will be used more largely in the future. The term "2,000 candle power" in itself impressed the people in the towns lighted as something worth having, and if they happened to find out that the lamps really gave only about a quarter of this candle power, the electric-light men had no difficulty in convincing them that "the 2,000 candle power lamp is one which sends 500 candle power in each of four directions from its place over the street crossing." Incandescent lamps have been most commonly used in the 25, 30 and 32 candle power sizes, with a few of 50 or 75 candle power, and some of only 16 or 20 candles. However, the distribution of the light from these lamps has almost always been aided by the reflectors over them, which is not the case with the arc lamps.

As a distribution system, the series circuit still holds almost a monopoly for street lighting. It lends itself so readily to the connecting of lamps scattered over a large territory that it was used with the Brush arc lamps just as soon as the differential winding made the operation of arcs in series a possibility. The number of lamps on a circuit and consequent voltage was limited only by the ability of the dynamo builders to properly insulate the parts of their machine. Eighteen years ago a circuit of 16 or 18 arcs was a high-voltage circuit, although the lamps then used were the so-called short arcs requiring only 25 to 30 volts each. Bare copper wire was used at that time, but sad experiences with it led to the "underwriters" and later to the so-called "weatherproof" wire, which is still used almost exclusively except for wires leading into the casing of weatherproof arc lamps, for which purpose rubber-covered wires are now preferred.

The size of the dynamos was at first larger in Europe than in America, as the 48 Jablochkoff candles installed 21 years ago in the Place de l'Opera at Paris were run on multiple circuits from three alternators (each with its own exciter), driven by three 20 horse power engines. This meant 16 lamps per generator, while the earliest Brush arc dynamos built at about the same time were made for a single arc lamp, and the two-light and four-light machines which followed them had the lamps in multiple. Then when the series lamp was perfected circuits of 12 to 18 lamps became common and dynamos gradually increased in size up to the so-called 60-light or 50-kilowatt type, which for years has been the accepted unit. However, the development of much larger constant-potential generators, and the evident increase in efficiency with the larger sizes stimulated the builders until we now have arc machines supplying as many as 150 of the 2,000 candle power lamps, or 200 of the 1,200 candle power. Some of these are so arranged that the lamps, while all in series, are distributed over three circuits, so that the voltage on any one circuit is only about a third of the total. Meanwhile there have been great improvements in the alternating-current arc lamps, and the perfection of such lamps for use on series circuits seems close at hand. When it comes, we shall be able to run both our arcs and incandescents from the same machine, so as to use the 200 or even 500-kilowatt generators (which already have reached such high efficiency) without needing the rectifiers

¹ Read before the Chicago Electrical Association, March 10, 1899.

now used to some extent in England for supplying current from alternators to arc lamps in series.

Incandescents for street lighting are usually connected in series across the primaries on the alternating generator, each lamp being provided with a suitable cut-out device (either in the base of the lamp or in the socket) to automatically close the circuit when the filament gives out. An exception to this is the Westinghouse plan of having an inductive or so-called "kicking" coil in shunt with the lamp, the coil being of too high resistance to consume much current ordinarily, but which will offer an inductive counter-electromotive force equal to the voltage of the lamp when the latter gives out.

The method of supporting the lamps varies from place to place, and, as a rule, has not had the proper amount of thoughtful attention paid to it. In the early days, when the number of arc lamps used was very small, these were put up on tall masts or towers so as to form an imitation moon, which was supposed to light a wide area. Such towers are still in use altogether at a number of places, and have also been retained in parts of other towns. They have the great advantage that they hold the lamp high enough not to glare into your eyes when walking toward them, but tall trees or buildings of any considerable height usually interfere with the distribution of light from them. Such towers generally had from two to six arc lamps each, and the next step was the placing of each of these lamps over a tall pole, so that the lamps could be distributed over the area to be lighted. The poles, being set inside the curbing, brought the lamp so close to the line of the shade trees as to cut off most of the light from the walk on the nearer side. To overcome this, lamps were hung out at the end of iron mast-arms, these being 10, 12, 15, or even 20 feet long, and, as a cheaper substitute, the cross-suspension wire method was then introduced (though mast-arms can now be put up as cheaply as the cross-suspension). Each of these methods has given good average results, yet there have been objections to each when universally used.

For a wide distribution of light from a lamp, the latter ought to be not less than 30 feet above the street, hence the mast-arms or cross suspensions were at first made to support the lamp over the center of the street and some 30 or 35 feet high. This brought the lamp above the foliage which shaded and darkened the walks, so the lamps were lowered to the common height of only 18 or 20 feet, bringing them so nearly on a level with the eyes of teamsters as to seriously dazzle them when driving toward the lamp. Reducing the candle power of the lamp reduces the intensity of this glare, so that a 340-watt or 240-watt lamp is less offensive than the 460-watt arc, and a 105-watt incandescent lamp still less so. (The energy required for the 460-watt arc will supply four or five incandescents scattered like our gas lamps, to give a more even distribution of lighting units.) Happily, the enclosing globes used

The distribution of lamps in a town, while still affected by the political influence of adjoining residents, is no longer done entirely in accordance with the clamor of the local constituents. The question used to be, Where shall we put a certain number of lights? Now it is, Where do we need the lights, and how shall we support them to avoid deep shadows? One recent installation had 14 per cent. of the arc lamps on mast-arms, 25 per cent. on short pole brackets, 60 per cent. on cross-suspension wires and one per cent. on pole tops. Even in this case



ALUMINUM AT NIAGARA.

many of the cross-suspension arcs might better have been replaced by four or five times as many incandescents, as is now frequently done.

Reliability of service is now insisted upon, and the contracting plant has to pay a rebate for every hour's lamp outage reported by police or by inspectors appointed for the purpose. Hence the adoption of such construction as will withstand high winds and sleet storms, of safety pulleys and pole-locks that will avoid accidents to the lamp, and of loop switches to cut out a portion of the circuit for repairs without interfering with the rest of the lamps.

From an artistic point, electric street lighting still leaves much to be desired. Only a small portion of the fixtures and lamps used have been designed on lines of beauty, and the average circuit is all but sightly. Still the lamps and fixtures are better looking than formerly, and the adoption of pole-locks has done away with the unsightly bundle of rope at each arc-lamp pole, leaving the loosely dangling wires leading to the center-supported lamps as the chief eyesore. Even this will be doomed as soon as an automatic cut-out pulley enables us to run the line wires taut to the lamp support, which we shall be able to do on the morrow.

To sum up the changes in street-lighting practice: Yesterday the cry was for large lamps and intensely bright illumination of some picked spots, regardless

Aluminum at Niagara.

One of the peculiar sights to be seen quite frequently on the streets of Niagara Falls, N. Y., is a great wagonload of aluminum passing from the lower plant of the Pittsburgh Reduction company to the upper works. The metal is of snowy whiteness, and as such a sight has never been witnessed by many people before, it immediately attracts attention, for it looks like a wagonload of silver. The aluminum glistens in the sun, attracting the attention of all. In the accompanying illustration there is shown a wagon loaded with about three tons of aluminum in "pig" form. It is being taken to the upper works of the company mentioned, where there is a remelting furnace, and the pigs will be remelted and run in the form of rolling bars, slabs, wire bars, waffles and different forms of ingots, and then shipped to the manufacturer of the various aluminum wares. Niagara Falls is the greatest aluminum center in the world, and it is little wonder that it should have some such novelties to offer.

C. S. Knight.

Chicago's latest acquisition to its list of prominent electrical men is C. S. Knight, the newly elected vice-president and general manager of the Siemens & Halske Electric company of America. Mr. Knight has taken his headquarters in Chicago and will direct the policy of the company and the operations of its forces from this city. He has long been closely identified with the electrical interests of Chicago and the West, and the new trust reposed in him will tend to promote this relationship.

Mr. Knight was born at Columbus, O., and passed his early life there. Thirty years ago he entered the service of the railroad system that is now merged



C. S. KNIGHT.

into the Pennsylvania lines west of Pittsburg. He continued in the transportation department until 1881, when, for five years, he engaged in the gas business at Fort Wayne, Ind., and then became interested in the Fort Wayne Electric company. When this concern was thrown into the hands of a receiver in June, 1894, and the Fort Wayne Electric corporation organized for the purpose of operating the business under contract with the receiver, Mr. Knight was chosen a director of the new company. This connection continued until February 1st, when he resigned the vice-presidency of the corporation and accepted his present position with the Siemens & Halske interests.

Mr. Knight has enjoyed unusual opportunities of familiarizing himself with the electrical interests of all branches throughout the country and he has kept in touch with them. Under his energetic direction the Siemens & Halske company may be expected to take a commanding position among the electrical manufacturing concerns of the country.

Negotiations have been completed by Tucker, Anthony & Co., Boston, Mass., whereby they will build and finance the Peoria and Pekin Traction railroad, which will be 10 miles long, between Peoria and Pekin, Ill., using both electricity and steam—electricity for passenger traffic and steam for heavy-freight traffic. The power house will be located midway between Peoria and Pekin, and it is proposed to put in three engines of 325 horse power each, and room will be provided for a 650 horse power engine as an auxiliary engine. The company has a 50-year traffic agreement with the Central street railway of Peoria, which road controls all the surface lines in that city. The following-named officers have been elected: President, Theodore J. Miller of Peoria; vice-president, W. T. Trumbull, Salem, Mass.; secretary and general manager, Louis E. Myers, Peoria, and treasurer, P. S. Saltonstall, Boston, Mass.

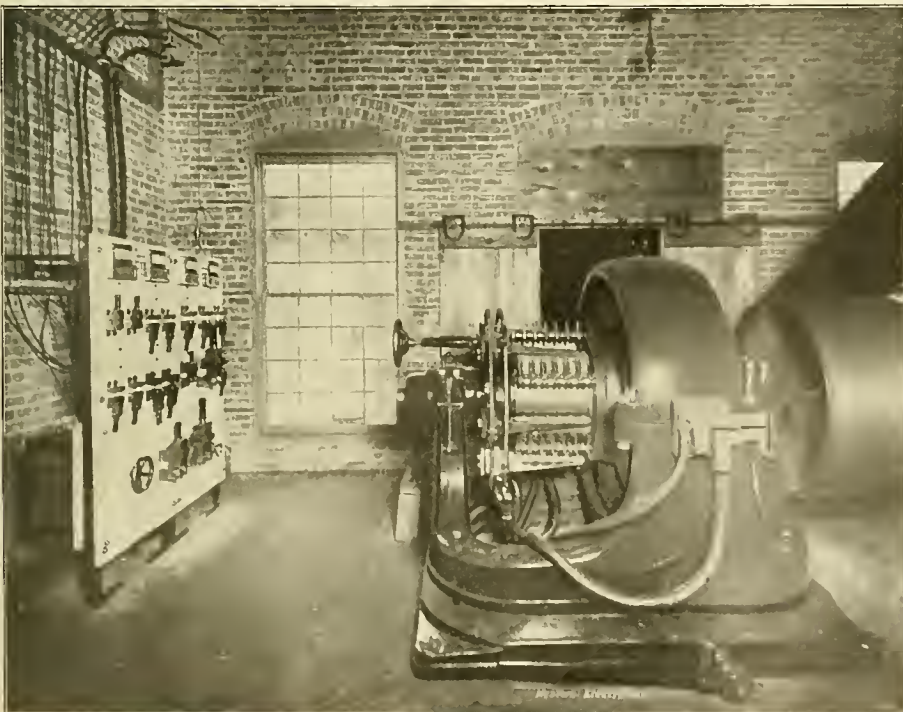


FIG. 4. AN ELECTRICAL SAWMILL.—POWER GENERATOR.

on long-burning arcs are reducing the glare, and the same is true when ground, opal or fluted globes are used.

The hours of street-lighting service vary, some towns being lighted from dusk till midnight, others until dawn, and a large share having the lights turned off when the calendar says that the moon will shine brightly. This means darkness whenever fogs or clouds hide the moon, but recent contracts avoid this by calling for the light every night and allowing lamps to be turned off when the moon is not hidden.

of the equally intense shadows intervening. To-day there is the tendency to have the rays of light overlap and to use lower candle-power lamps in the alleyways and other dark nooks and on the streets of the outlying districts. To-morrow we may look for smaller units and a great many more of them.

Yesterday the type of lamp and method of support picked for the business district was used throughout. To-day many towns use the bright dis-

[Continued on page 190.]

Electric Appliance Company in Its New Home.

Honestly won success challenges the admiration of every fair-minded person. No one with a spark of magnanimity begrudges the well-earned reward of merit. So when a clean, well-managed business enterprise like that of the Electric Appliance company of Chicago gives unmistakable evidence of successful growth by appropriating to itself a large new five-story building especially arranged for it, it is entitled to hearty congratulations from all interested in the progress of electrical industries in the West.

The steady and healthy development of the company in its seven years of life shows that it has a reason for being, that it has satisfied the needs of a constantly increasing number of customers, and that

occupies the space to the left of the general offices. In the rear of the offices and store, and occupying the remainder of the first floor, is the room devoted to outgoing and incoming freight and express.

On the second floor the manager of the shipping department has his offices. His assistants' desks and the benches for assembling and for the packers take about one-half of the space on this floor, the rest being used for bins for shades and shade holders, sockets, switches and miscellaneous stock.

The third, fourth and fifth floors, with the exception of the list of goods stored on each, may be well described in the same paragraph. They are arranged with bins, racks and shelves to best suit the stock carried in them. The telephone department is located on the third floor, as well as the office of Mr. S. A. Dinsmore, the manager of this department.

Last, but by no means the least important part, is the basement, with its accommodations for heavy goods

Mr. Chapman is receiving applications for space, and it is desired that intending exhibitors indicate the character and dimensions of the space they will require. Secretary Penington has issued a circular explaining the conditions imposed by the association and giving the necessary directions for shipment and installation of exhibits. Allotment of space will be made on September 1st.

General Meeting of the Institute to Be in Boston.

At the meeting of the American Institute of Electrical Engineers in New York on March 22d a paper was presented by Dr. M. I. Pupin of Columbia University on "Propagation of Long Electrical Waves."



Willard W. Low, President Electric Appliance Company.



Mr. Low's Private Office.



General Offices.

ELECTRIC APPLIANCE COMPANY IN ITS NEW HOME.



Thomas I. Stacey, Secretary and Treasurer Electric Appliance Company.



Mr. Stacey's Private Office.

it has been well managed. This success is the more noteworthy, as at least four of the company's seven years of existence were a period of marked business depression. The outlook for continued progress is excellent, and Messrs. W. W. Low and Thomas I. Stacey, who founded the business and made it what it is, have good reason to be proud of their work. These gentlemen are still attending strictly to business—President Low to the sales, Secretary Stacey to the office management—and their active personal efforts are a guaranty that the company's standard of achievement will be borne steadily onward.

It was on December 1, 1891, that the company started in business, using one floor of the building at 242 Madison street, with 2,500 square feet of space. One year later another floor was added. In the latter part of 1894 the entire building, or 8,000

—armorite and armorduct tubing, "O. K." bare copper and iron wire, cross-arms, brackets, polesteps, etc.

On each floor is a stock clerk, who must be thoroughly posted on the stock under his immediate control. All bins and shelves are lettered or numbered, classified and indexed in such a manner that the assembler can at once place his hands on the article wanted. Every arrangement or device which would in any way help toward the desired end—a quick shipment—has been employed. The quick-running elevator and lifts, the extensive house telephone system connected at the switchboard on the first floor with the city exchange and with the long-distance lines leading from Chicago, perform an important part in the dispatch of business.

To all its friends, to all electrical people everywhere, the Electric Appliance company extends a

The paper was discussed by Messrs. Bradley, Carty, Kennelly and Steinmetz.

At the meeting of the council in the afternoon the following-named associate members were elected: Tom Howard Gregg, Tompkinsville, N. Y.; Harold J. Horn, Trenton, N. J.; Howard S. Johnson, Columbus, O.; Herbert S. Miller, Elizabeth, N. J.; William D. Pomeroy, Akron, O.; Thomas Byrd Whitted, Schenectady, N. Y.

The returns from the nomination blanks sent in by the membership were canvassed, and the following-named gentlemen were announced as the council nominees:

For president, Dr. Arthur E. Kennelly; for vice-presidents, J. W. Lieb, Jr., Charles F. Scott, L. B. Stillwell; for managers, C. O. Mailloux, S. Dana Greene, C. S. Bradley, W. D. Weaver; for secretary,



City Sales Department.



Work Room in Telephone Department.

ELECTRIC APPLIANCE COMPANY IN ITS NEW HOME.

square feet was required. The new building has 30,000 square feet of floor space.

Now well settled in its new building, which is at 92 and 94 West Van Buren street (corner of Jefferson street), the Electric Appliance company has provided an attractive and well-arranged quarters, as pictures on this and the next page show very clearly. The company is enabled to carry a larger stock than before, and every facility is provided for filling and shipping orders with speed.

Passing through the main entrance on Van Buren street, the visitor notes on his left the private office of Mr. W. W. Low, the president of the company. To the right and opposite is the office of Mr. T. I. Stacey, secretary and treasurer. To the right of this again, and extending back about 70 feet, are the general offices. The store, or city sales department,

hearty greeting, with the invitation to visit it in its new home.

American Street Railway Association.

The local representatives of the American Street Railway association have perfected their organization and completed their plans for the annual meeting and exhibition in October. A general committee will have charge of all matters pertaining to the gathering. It will be composed of the chairmen of the several sub-committees as follows: M. K. Bowen, banquet; George A. Yuille, finance; J. M. Roach, entertainment; George O. Nagle, halls and hotels; H. M. Sloan, reception and ladies; H. H. Windsor, publicity and information; F. L. Fuller, transportation; James R. Chapman, exhibits; T. C. Penington, representing the administration of the association.

Ralph W. Pope; for treasurer, George A. Hamilton. The regular election will proceed after the distribution of the ballots early in April, and the result will be determined at the annual business meeting, which will be held in New York city May 16th.

The following-named local honorary secretaries were appointed: H. F. Parshall, London, for Great Britain; James S. Fitzmaurice, Sydney, for Australia; Prof. Robert B. Owens, Montreal, for Canada.

The council appointed Dr. F. A. C. Perrine to fill out the unexpired term of Lieutenant W. F. C. Hlasson, who has resigned from the office of manager on account of his removal to the Hawaiian Islands.

The council decided to hold the fifteenth general meeting at Boston during the last half of June, the exact date to be fixed by the executive committee.

Big Companies in Patent Litigation.

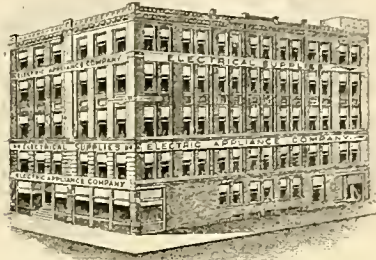
After a period of comparative quiet in the patent litigation between the prominent electrical manufacturing companies, the contention has been reopened by suits brought against the General Electric and Western Electric companies by the Westinghouse Electric and Manufacturing company.

The action between the Westinghouse and General Electric companies seems to be based on a misunderstanding of the contract between these companies, entered upon three years ago, for "a recognition of the patents of each company by the other, and the right, subject to certain exclusions, to a joint use thereof." The patents which have caused the present dispute are those of Tesla on the multiphase system. The Westinghouse company, which is the plaintiff, alleges that the General Electric company is negotiating contracts for use of the multiphase system, in violation of the contract between the two companies. The action was brought in the United States Court at Utica, N. Y., on March 21st, and is set down for trial, according to an Associated Press dispatch, for April 4th. Particulars of the exact grounds of the suit are not obtainable in the West. The New York Tribune asserts that "it is understood on good authority that the bringing of this suit does not signify that the friendly relations between the Westinghouse and General Electric companies will be broken off." On the other hand, the New York Sun, in an article reviewing the situation on March 23d, takes the view that the relations of the companies are less cordial than formerly. The greater part of the Sun's article is given:

Both companies maintain that their differences have their origin solely in the varied interpretation of a contract entered into in 1896 between the companies providing for an exchange of licenses. Three years this month [March, 1896] the companies entered into an agreement to allow each other to use their several patents under conditions restrictive of territory and customers. The allegation of the Westinghouse company is that the General Electric company has violated the terms of this agreement by contracting to furnish the Edison Electric Illumination company with the multiphase generators, whereas the United Electric Light and Power company of this city is the exclusive licensee of the right to use this apparatus.

The General Electric company maintains that a different interpretation of the agreement allows it to supply these generators to the Edison company. It declares, and the Westinghouse company does not deny it, that it has sold these generators to the Edison company before. No protest was made at the time by the now plaintiff company, and this fact lends color to the report current in Wall street yesterday that the suit is an entering wedge in a coming split in the pool of patents between the Westinghouse and General Electric companies. The plaintiff company and its licensees, the United Electric Light and Power company, by antagonizing the Edison company, place themselves in opposition to William C. Whitney's new \$25,000,000 electrical concern, the New York Gas and Electric Light, Heat and Power company. This new company recently absorbed the Edison company and with it the Manhattan Electric Light company. It has control of the subway system of the Empire Subway company. The Mount Morris Electric Light company is controlled by the Light, Heat and Power company, and the Block Electric Light and Power company is a more recent acquisition. There was a report that the United company was about to be consolidated into the new concern, but the negotiations never came to a successful conclusion. Another Wall street report is that the Westinghouse

company and its officers is for alleged patent infringement, but is of entirely different character from the suit against the General Electric company. The Western Electric company is charged, in a bill filed by Gifford & Bull of New York, the Westinghouse company's solicitors, with infringing patent No. 573,009, granted to Benjamin G. Lamme of Pittsburgh on December 15, 1896, and assigned to the Westinghouse Electric and Manufacturing company. This patent is for a direct-current dynamo-electric generator, and the claims cover methods of construction. The defendant is charged with general infringement. Suit has been brought in the United States Circuit Court for the Southern District of New York. Mr. George P. Barton, the patent attorney for the Western Electric company, said, in answer to the question of a representative of the



NEW BUILDING OF THE ELECTRIC APPLIANCE COMPANY.

Western Electrician, that he had not had time to examine the bill of complaint carefully, and that he was not now prepared to give an opinion on the merits of the case.

ELECTRIC VEHICLES.

The New England Electric Vehicle and Transportation company, with a capital of \$25,000,000, has been incorporated in New Jersey. The company is authorized to manufacture appliances for operating vehicles and to manufacture and operate vehicles themselves. The incorporators are James E. Hayes, Camden, and Arthur Phillips and Augustus Treadwell, Jr., of New York.

The Nassau County (N. Y.) Motor Coach company has been organized, with a capital of \$150,000. The directors are all stockholders in the electric railway which is to operate in Nassau County. The trolley road and the coaches will make connections. The motor company was formed in order that the Merrick road and other thoroughfares can have better transportation facilities. Legislative

ready. It is expected that during the next year over 1,000 motor cars and hackney will be running and that by degree the 3,500 cabs or cabs now in use will be replaced. The new cabs are to be supplied with batteries capable, it is claimed, of working over about 37 miles without need of replenishment. Four kinds of vehicles are to be put in circulation. First come the landaulet, open or closed, with four places, and to be hired at two francs the journey, or two francs 50 centimes the hour. Next comes a coupé or ordinary sort of cab or four-wheeler, then the vehicle with rotund interior for four persons, and the imitation of the existing hackney, with a large shelf seat or strapontin, in addition to the usual accommodation. All these vehicles, with the exception of the landaulet, will be run at the tariffs now in use. The delay in getting out the new vehicles has been caused by the difficulty of finding a proper type of accumulator. The drivers of the vehicles will be smart-looking fellows, unlike most of the existing Paris cabsmen, who seem rather ponderous and clumsy in their high hats and long coats. The motor conductors are to wear white-glazed flat caps, black jackets and trousers, with yellow piping and gilt ornaments, bearing the company's monogram.

Argentine News Items.

[Special correspondence of the Western Electrician.]

The rumor that the General Electric company of the United States intends to open a branch house in Buenos Ayres for the supplying of electric materials and machinery has been verified. This will insure a thoroughly up-to-date supply house and goods always in stock at reasonable prices. It also proves that the American electrical houses are beginning to appreciate the development that is now taking place in all parts of the Argentine Republic, and that they are going to compete with the Germans and English for the trade.

The following shows what change of traction from horse to electric has done for the Capital Tramways company of Buenos Ayres, and the managers say more promising results are in sight. The Capital Tramways company's gross receipts, converted into gold, at average rates, were as follows: Aggregate gross receipts from January 1 to November 17, 1898, \$229,650, corresponding period 1897, \$130,450; increase, \$99,200. Mileage open in 1898, electric, 17.64 kilometers; horse, 6.63; total, 24.27; in 1897, horse, 14.79.

The Concordia municipality has contracted with Señor Pablo Sabrega for an electric-light station in that city. The works will be situated in Salto Grande, so as to utilize the water power of the River Uruguay. As this is the fourth or fifth time the concession has been granted, it is hoped the works will now be carried out.

Enginer Marengo, the new chief of the public lighting department of Buenos Ayres, has reported to the mayor on the clause in the electric-tramway companies' concessions requiring it to give free lighting. His report condemns the clause as impracticable, but he is of the opinion that in exchange the companies might be taxed one per cent. on each \$1,000 per kilometer revenue. Instead of encouraging the remaining tramway companies employing horse traction to change to electric, which is conceded by all to be beneficial to the city, the authorities are discouraging them by every means in their power.

One of the most novel requests for a concession that has ever been made to any municipality in the world has just been received by the Buenos Ayres municipality. The would-be concessionaire desires a 20-year franchise for placing electric bells at the vaults and tombs in the Recoleta cemetery, so as to enable the owners to call the "peons" when they are wanted.

The municipality has resolved that, in future, all applications for electric-tram concessions must be accompanied by full technical data concerning construction materials, etc. This will prevent a number of would-be concession-mongers from appearing on the scene.

The director of public lighting has been authorized to contract with the German Electric Light company for the placing of 150 arc lamps in hitherto unlighted portions of the city of Buenos Ayres. When these new lights are in operation the city will be one of the best lighted in the world, and will be able to determine soon whether the alternating or the continuous-current arc gives the better result, and which is more suitable for street lighting, as both are now being used.

The Pacific Railroad company is now advertising in the local papers for a capable man to look after the electric plant in its coaches. In this connection it may be mentioned that there is a lack of capable electricians in this country, and that many really good openings are constantly occurring for young men who have had an electrical training. A large number of the so-called electricians now holding responsible positions with the electric-light and traction companies of this city have had no more training or experience in the field in which they are now posing as experts than was to be obtained in placing electric bells or performing the duties of linemen. This will explain the large quantity of electrical machinery that has broken down and the armatures that have burnt out. These so-called electrical engineers have pronounced this apparatus defective, whereas, in reality, its failure was solely attributable to their inexperience and consequent lack of attention.



ELECTRIC APPLIANCE COMPANY IN ITS NEW HOME.—VIEW IN BASEMENT.

company, which has the contract to equip the Third Avenue railroad with the underground trolley system, has failed in its endeavor to get the \$18,000,000 contract to equip the Manhattan elevated railroad with electricity.

The neglect of the Westinghouse company to attempt any restrictive measures against the General Electric company hitherto when it supplied the Edison company with the multiphase generators is given as a basis for the report that the new litigation is begun for other reasons than merely to protect the rights of the licensee. Current with the talk that the Westinghouse people had lost the Manhattan contract was the report that the General Electric company was practically assured of the contract.

If the suit of the Westinghouse company is successful, Mr. Whitney's company will be unable to use the Tesla multiphase generators, which are admitted to be the most economical. It is known that the new Light, Heat and Power company intends to transmit power on an enormous scale, and to be deprived of the use of this apparatus will, it is said, seriously cripple the operations of the company.

The suit brought by the Westinghouse Electric and Manufacturing company against the Western Electric

acts prevent the laying of tracks for a surface road on these thoroughfares, and on this account the motor coaches will be used.

Articles of incorporation of the Columbia Automobile company, with a capital of \$3,000,000, were filed in Trenton, N. J., on March 23d. The company is authorized to manufacture and operate vehicles propelled by electricity, compressed air or other power. The incorporators are Elliott Mason, Andrew H. Scoble, John M. Scoble, Louis R. Moore, Anthony N. Jeshera, Sherman N. Granger, Francis R. Foraker, Roland B. Harvey of New York; W. B. Greely of New Rochelle, N. Y., and E. S. C. Young of Jersey City.

A Paris correspondent says that the General Company of Vehicles is about to send out 110 electric carriages, the number being increased as other cars are



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CORRESPONDENCE relating to electricity or any of its practical applications is cordially invited, and the co-operation of all electrical thinkers and workers earnestly desired. Clear, concise, well written articles are especially welcome; and communications, views, news items, local newspaper clippings, or any information likely to interest electricians, will be thankfully received and cheerfully acknowledged.

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CONTENTS OF THIS NUMBER.

Table listing contents with page numbers, including sections like 'An Electric Sawmill', 'Electric Street Lighting', 'High Water Mark', and 'DEPARTMENTS'.

Mr. Medill had good ability and great energy, which was rewarded with success, and he delighted in patronizing art, literature and science and performing public service.

A press dispatch from London says that on March 28th Marconi successfully carried out his experiment of telegraphing across the English Channel, between Dover and Boulogne, without connecting wires. A message sent to England by Marconi was promptly answered from Dover. There was not the slightest hitch. Messages were passed and repassed quickly and easily. The distance was 32 miles, and the greatest previous distance covered had been 18 miles. Marconi has found that the distance to which signals may be sent varies according to the square of the height of the vertical conductor at each station. For signaling 18 miles he used a conductor 80 feet high, and in his application to M. Lockroy, French minister of marine, he contended that with a conductor 114 feet high he could establish communication between points on opposite sides of the Strait of Dover, and even go 10 miles farther. Marconi seems to have proved that when a proper vertical wire or conductor is employed, no hindrance to signaling is caused by hills or other obstacles or by the curvature of the earth. The experiments were conducted with the Morse code, which was read as distinctly, it is said, as if the termini had been connected by wires. The London Times printed a 100-word dispatch, the first press message by the Marconi system of wireless telegraphy, describing the experiments between Dover and Boulogne.

Those who are studying the problem of introducing automobiles and auto-trucks into general use in this country should watch the forthcoming experiments at Liverpool to test the capacity and adaptability of motor vehicles for heavy traffic. The trials will begin on the morning of Monday, July 31st, and will conclude on the evening of Wednesday, August 2d. Trial runs will be made from Liverpool over distances from 30 to 40 miles. There will be four classes of vehicles eligible, the minimum loads being two tons, 3 1/2 tons, five tons and six tons. The vehicles must be propelled by mechanical power alone. No restrictions will be placed upon the methods employed in utilizing this power or the form in which the energy is applied. The contest will be conducted under the direction of the Self-propelled Traffic association of Liverpool. Special efforts will be made to induce American manufacturers to send specimens of their carriages and wagons to the test, as the claims made for them have attracted universal attention and have encouraged the hope that they might be compared in operation with the French and English product. The specifications governing the competition have been carefully prepared and are now ready for distribution. The United States consul at Liverpool says that "the hope has been officially expressed that vehicles from the United States will take part in the competition." There is ample time to prepare for the event, and it is to be hoped that American manufacturers can see some commercial advantage in being represented on this occasion.

Mention has been made frequently of the great value of the searchlight to the American squadron in the naval operations before Santiago harbor that resulted so disastrously for the Spanish admiral's ships. In preventing the egress of the Spanish cruisers from the harbor entrance at night the beams of light from the American men-of-war had a twofold value—they would have revealed the presence of the enemy's vessels and also, by blinding the Spanish navigators, seriously interfered with the handling of their ships in the difficult channel. The latter point has not been dwelt upon so much as the value of the searchlights in apprising the Americans of the actual presence of the Spanish ships. But it was of great importance, as is shown by a chapter in W. A. M. Goode's book, "With Sampson Through the War," contributed by Admiral Sampson himself. The admiral says: "Had it not been for the use of the searchlights by our ships to illuminate the channel by which the Spaniards must necessarily come out, they probably would have selected the darkness. After the destruction of the Spanish fleet many of the captured prisoners freely expressed their opinion

that it was impossible to pilot their ships out through the narrow channel with such a powerful light shining in the eyes of the officers." However, Admiral Sampson expresses the opinion that Cervera would have had a better chance had he chosen the night time to make his escape, "especially had the hour been set to coincide with a passing storm, which would have diminished the intensity of our searchlight and would have greatly increased the intensity of the darkness."

The awakening interest in foreign trade among American manufacturers of all lines, and especially of the higher class of machinery, corroborates the claims that had been made regarding the advancement of this country among the great trading nations of the world. This is especially true in its application to the electrical manufacturers of this country. The question of securing foreign markets to take the surplus stock which they are now producing and the greater surplus which they might produce with their natural and mechanical advantages if they enjoyed a larger share of the world's export trade is one of the first importance. That electrical manufacturers are alive to the possibilities of commercial expansion is indicated by the fact that during the year 1898 the exports of electrical machinery reached the enormous value of \$2,523,644, as compared with \$917,453 in 1897. Notwithstanding the fact that the demand of the home market upon American manufacturers has been unusually large, electrical manufacturers increased their foreign trade to the extent of \$1,606,191 in 1898. The result proves that the skill of the American workman is universally recognized and the reliability of his work accepted. American electrical exports increase year by year, and find their way to more distant localities, where they would only be acceptable upon the assurance given by actual experience that they can be relied upon to perform their duties in unfamiliar hands, and without supervision or care from those skilled in their production.

The opportunity thus presented should be accepted and its advantages reaped by the country at large. The reputation which American products have already established has but to be maintained in order to command the trade of the most profitable markets of the world to-day.

Attorney-general Griggs has rendered an opinion on the application of the Commercial Cable company of the United States for permission to land a submarine cable in Cuba and Porto Rico, holding that the right could not be granted. The decision is based both on the position of the executive branch of the government and on the declaration of Congress in the Foraker amendment to the army appropriation bill of the last session. The position of the executive departments of the government on the general subject of franchises in Cuba as established in previous cases is outlined as follows: "In all instances heretofore, where applications have been made to this government, exercising the temporary control and government of the island of Cuba, for grants or concessions which usually flow from the depository of sovereign power, the executive departments have taken the ground that under the circumstances by which the United States came into the temporary administration of affairs in Cuba, and in view of the fact that it is the declared purpose of the United States, when a stable government shall have been there established, to retire from the island and leave the government thereof to the inhabitants, it would be inexpedient to grant such applications except in case of absolute necessity."

Concerning the Spanish franchises under which the present cables are operated, the attorney-general says: "The conclusion which I have arrived at renders it unnecessary for me to discuss or decide the objections raised on behalf of the Western Union Telegraph company, lessee of the International Cable company of New York, which companies claim an exclusive grant under a concession from Spain, made in 1867, which exclusive grant, it is claimed, has not yet expired." This leaves the whole question of privileges granted under the old Spanish regime undecided, and the government's attitude toward companies now conducting public enterprises in the new American possessions is still problematical.

Joseph Medill, the distinguished editor of the Chicago Tribune, who died recently at San Antonio, Texas, was a great admirer of Benjamin Franklin, and on June 6, 1896, caused an imposing monument to be erected in Lincoln Park, Chicago, in memory of the great philosopher, statesman and scientist.

FOREIGN EXCHANGE NOTES.

A company formed in Brussels under the name of *Compagnie Hongroise des Tramways et de l'Éclairage Electriques d'Oedenbourg et de Steinamanger* will soon commence work at its new branches, among which are the supplying of electric light and tramcars to the towns of Sarvar, Steinamanger, Ikerver and Oedenbourg. Power will also be supplied to run mills and agricultural machinery, plows and threshers.

The manager of the Yokohama agency of Siemens & Halske sent the *Japan Times* the following news: "As published by you some months ago, we secured a contract with the Chinese government for the construction of an electric railway in Peking. We have now received telegraphic advice that another contract for a central power station for lighting the city by electricity has been given to us. The ground on which this building is to be erected has already been bought."

According to the *Oesterreichisches Handels-Journal*, the Brussels *Société Internationale d'Enterprises Electriques* has formed, with the *Paris Société Generale*, a Russian electrical company, capitalized at 10,000,000 francs. This Franco-Belgian electricity and tramway trust has organized three sub-companies to supply Reval, Kronstadt and Sophia with electric cars. It has further taken a contract to supply the horse trams in Wilna, Tula, Samara, Woronesch and Minsk with electric motor power.

The *Société Electrique de la Méditerranée* has taken several contracts to supply electrical plants in Greece. The contracts were first given to a German company, which, however, forfeited them. One of the contracts is with the town Kephallonia, to supply an electrical center, comprising 300 incandescent lamps and three arc lamps. The electric light for houses will probably require more than 1,000 incandescent lamps. The excise duty has been hypothecated as a guarantee for payment. The contract is to run 60 years, at the end of which the plant becomes the property of the town. Another contract is to supply the town Kalamata with electric light and an electric line between the town and the port, lying two kilometers away. Contracts have also been made with Syra, Patras, Etion and Kalavryta.

A writer in a recent issue of the *Oesterreichisches Handels-Journal* of Vienna says that it has generally been supposed that incandescent lamps could not set anything on fire. On the basis of this they have been used among tapestries in a very careless way. But after several fires had been caused by incandescent lamps, it became necessary to investigate whether the lamps were dangerous or not. The result is shown that the amount of heat given out by an ordinary incandescent lamp is sufficient to cause the fire. If an incandescent lamp is put in a bowl filled with water and the current turned on the water will get warm and soon commence to bubble. An experiment with cotton showed a better result. A lamp was put in among some cotton, and in a short while the cotton was set on fire. Celluloid will begin to burn in five minutes after the lamp has been placed next to it. Incandescent lamps have therefore been declared dangerous, and are subject to the same rules of precaution observed by other lights.

Large Arc Lamp.

[From *Fachblatt*, Vienna.]

The firm of Siemens & Halske, in Charlottenburg, near Berlin, completed the other day a 100,000 candle power arc lamp. The lamp was set up and decorated in the lamp-testing room.

Electric Car Lines in Germany.

[From *Electrotechnische Zeitschrift*.]

The number of towns in Germany with electric car lines is reported as 68, and in 35 more similar enterprises are projected or under construction. The total capacity of dynamos and accumulators driving the 68 lines is 38,451 kilowatts. The average kilowatts required for one kilometer of track (ranging from 9.6 to 50.2 kilowatts per kilometer) is found to be 20.7, while the average number of kilowatts required per car (ranging from 6.2 to 46 kilowatts per car, according to local conditions) is 14.2.

Electric Cars in British Guiana.

[From the *Daily Gleaner*, Kingston, Jamaica.]

Mr. W. B. Chapman, who was recently in Jamaica as a promoter of the new electrical car undertaking, has been exploiting British Guiana on behalf of a Canadian syndicate. He has just bought out the British Guiana Electric Lighting and Power company.

In his opening speech at the Combined Court, last month, the governor of the colony said: "I should also not omit to mention the near prospect of a great extension of the means of communication in the city of Georgetown through the acquisition by a syndicate of Canadian capitalists of the property

and privilege of the existing tramways company. A bill has already been introduced and read the first time in the Court of Policy for affording the necessary legislative power required by the new company, who propose to introduce a system of electric tramways and also to take over the whole business of supplying electricity, whether for lighting or for motor purposes."

Automobiles in Europe.

[From *Continental Exchange*.]

Belgium and France have hitherto been prominent mainly in the development of the automobile industry. Now a company is being formed in these countries to establish a complete network of electrical stations, which will gradually branch out and take in all of Europe. According to *Neues Wiener Tageblatt*, Vienna, the stations for the charging of accumulators and the sale of materials and supplies for the automobile traffic are to be established along the large roads, at a rate of one station for every kilometer. Twenty stations are already under construction between Paris and Brussels, and within a short time work is to be commenced on some other more important lines. It is intended that these stations shall supply the neighborhood with electric light. The capital of the company, 5,000,000 marks, has been nearly all taken up.

Electrical Development in Burma.

[From the *Rangoon Gazette*.]

At the works of the Burma Ruby Mines, Limited, Mogok, there has just been successfully set to work a large electrical power and light installation, and as this is the first of its kind to be introduced into Burma, a short description will be of interest.

Owing to scarcity of wood and other causes, the annual fuel bill at the mines has always been a very important consideration, and it was in order to reduce this heavy item of cost as much as possible that Mr. A. H. Morgan, the company's able engineer, first directed his attention some two years ago to the feasibility of utilizing some of the water power which abounds in the vicinity for working the mines. After an inspection of some of the leading mines in South Africa which have adopted electricity as a form of power, an order was placed with Messrs. Johnson and Phillips of London for a complete plant, comprising turbine, dynamo, transformers, line material, motors, pumps, arc lamps, etc., and the whole of this has now been erected and is working with the greatest satisfaction.

Power is taken from a neighboring river at some falls about a mile and a half from the mines. A strongly built house has been erected on the river bank, and in this the turbine and dynamo are placed, which are capable of delivering 130 brake or useful horse power at the mines. The turbine is of the Pelton wheel class and runs at a speed of 110 revolutions per minute, under a head of water of 60 feet. It is provided with a large grooved fly-wheel for rope driving. The dynamo is a two-phase, alternating-current machine of special design for power work, and runs at a speed of 450 revolutions per minute.

From this power house the current, at a pressure of 2,200 volts, is taken overhead (long bare copper wires, supported on large porcelain insulators, fixed to poles placed at suitable distances apart) to another building known as the transformer house, erected in a convenient position at the mines, where it is transformed down to a lower and safe pressure for working the motors. These motors are employed in driving pumps and other machinery about the mines, and, owing to the highly increased economy attained by this system, it is expected that steam power will shortly be done away with altogether and electricity substituted in its place.

Several arc lamps, each of 2,000 candle power, are used for lighting the mines and are found to be a great improvement over the old method of oil lighting, while a telephone service connects the power and transformer houses, so that communication between the two can be readily established at any time.

Mr. H. Shaw Dunn, the assistant engineer, was responsible for the erection of the plant, which was finally supervised and started at work by Mr. F. M. Short, who is a member of the American Institute of Electrical Engineers, and is the electrical engineer for Balmor, Lawrie & Co. of Calcutta, who are the sole agents out here for Johnson & Phillips.

Three-wire Patent Litigation.

The Imperial Electric Light, Heat and Power company of St. Louis, which is the competitor of the consolidated local electric-lighting interests in St. Louis and which has built up a large and successful business in supplying light and power to customers throughout the principal part of the city, has been sued by the Edison Electric Light company upon patent No. 274,200, which is the so-called "Edison three-wire patent."

This patent has been considered a powerful weapon by the General Electric company for a long time, but there has never been a decision of any court upon its merits. All decrees which have been obtained have either been consent or default decrees, and the patent, so far as the courts are concerned, stands exactly as if it had never been before the

courts at all, except so far as the particular defendants in the several suits are concerned. It is well known also that there are a considerable number of plants operating with the so-called "three-wire system" described in Edison's patent and not licensed thereunder. It has been the policy of the General Electric company to threaten with suit anyone who starts to use the system set forth in this patent, and then, if the threat failed and the plant was installed and operated, the threatened suit has been either withheld, or, if brought, has been allowed to go by default unless some settlement was secured after suit was begun. The three-wire Edison patent, therefore, is a shining example of the old saying that "He who fights and runs away may live to fight another day."

The patent is now near its expiration, and the General Electric company has determined to put it to a test in this case. The defendant, the Imperial Electric Light, Heat and Power company, claims to have anticipations of the Edison patent which completely destroy its validity.

The hearing on the motion for preliminary injunction is now set for April 10th. The complainant is represented by Messrs. F. P. Fish and R. N. Iyer; the defendant by George H. Knight and Charles A. Brown.

The Gambler's Electromagnet.

Among the battered flotsam and jetsam that has accumulated in a second-hand store not a great distance from Jackson Square, says the *New Orleans Times-Democrat*, is a shabby round table with a curious secret, and no doubt a still more curious history. The top was once covered with green billiard cloth, which now is worn to tatters, and discloses a steel plate set in the center and perhaps to inches square. The whole top is loose and can be removed, revealing an interior space containing a horseshoe magnet wound with wire and connected with an armature very much like that of an ordinary telegraphic instrument. A close examination shows an insulated wire running down one of the legs to a small knob or button, protruding on the outside. When the top is in place the steel plate rests directly over the magnet. This strange device is explained clearly enough by its present owner. "It is a dice table," he said, "on which a lot of money has been won. When it was in order there was a good-sized battery inside, connected with the magnet. When the knob on the leg was pressed the current was turned on, and that made the steel plate magnetic. The dice they used with it had small metal disks on one face, and as long as the current was on they naturally fell that side down. When the knob was released they would fall any way they chanced to come, so all that was necessary for the operator to do was to keep his knee on the button and he could absolutely control his play."

Changes in Westinghouse Personnel.

Mr. Maurice Coster, for three years manager for the Westinghouse Electric and Manufacturing company at Chicago, has accepted the position of agent-general of the *Société Industrielle d'Electricité Procédés Westinghouse*, the French company newly formed to manufacture and sell Westinghouse electrical machinery and apparatus on the continent of Europe. After May 1st Mr. Coster's headquarters will be at No. 45 Rue de l'Arcade (Boulevard Hausmann), Paris. The new company is erecting a factory at Havre. Mr. Coster expects to leave Chicago on April 8th, and, after spending a few days in Pittsburg, will probably sail from New York on April 16th. A farewell dinner in his honor is announced by the Technical club, of which he was an active member, for Thursday evening, March 30th.

Mr. Coster is exceptionally well qualified for his new position. He has wide experience, both as a mechanical and electrical engineer and as a manager of electrical sales. He is a native of Holland and speaks Dutch, French, German and Spanish as well as English. He came to this country in his youth and is a graduate of the Stevens Institute of Technology. He has had practical experience in American machine shops and on railroads, managed a sugar refinery in South America and traveled in Europe. Since 1888 Mr. Coster has been connected with Westinghouse interests. He was first employed as an engineer and erected several important central-station plants. In 1891 he was transferred to the selling department, and soon after he was placed in charge of the territory served by the Pittsburg office of the Westinghouse Electric and Manufacturing company. After the death of his wife, in 1895, Mr. Coster was, at his own request, transferred to the Chicago office, and in January of the following year he was made manager of it. In Chicago Mr. Coster has made a fine record. He has brought about many important sales, built up the business of the company generally and made many friends for himself and his company. His departure will cause real regret.

Mr. Arthur Hartwell succeeds Mr. Coster as manager of the Chicago office of the Westinghouse company. Mr. Hartwell comes from Pittsburg, and, like his predecessor, is experienced in the affairs of the Westinghouse company. He was Mr. Coster's successor as manager in the Pittsburg office and now follows him in Chicago.

DEVELOPMENT OF THE TELEPHONE FIELD.

Formation of the Independent Telephone "Trust."

Preliminary arrangements were completed at Chicago last week for the organization of a new telephone manufacturing company, with the avowed object of absorbing the principal companies now manufacturing and dealing in apparatus and supplies for the equipment and operation of independent telephone exchanges and private lines. The promoters of this proposed trust are William T. Blaine and Sterling L. Bailey of Chicago, and they have been assisted by William P. Williams, assistant treasurer of the United States, who is in charge of the sub-treasury at Chicago. Mr. Williams is supposed to have secured the financial backing for the undertaking. P. C. Burns, president of the American Electric Telephone company of Chicago, and owner of the Keystone Electric Telephone company of Pittsburgh, the Northwestern Telephone Manufacturing company of Milwaukee and the Laclede Battery company of Kokomo, Ind., has also been actively interested in the formation of the combination, and it is generally believed that his influence will predominate in the management. Mr. Burns, Mr. Blaine and Mr. Williams are now in the East, and it is understood that before their return the formal organization of the new corporation will be accomplished.

It was announced last Saturday by Mr. Burns that 21 companies would be included in the consolidation and that the capital stock would be \$7,000,000, half preferred and half common; that the combination would be known as the American Independent Telephone company, and that it would be incorporated under the laws of New Jersey. Mr. Burns furnished the following list of names of 20 companies that, as he said, would be included in the combination:

American Electric Telephone company, Chicago.
Northwestern Telephone Manufacturing company, Milwaukee.
Keystone Electric Telephone company, Pittsburgh.
Laclede Battery company, Kokomo, Ind.
Victor Telephone Manufacturing company, Chicago.
Western Telephone Construction company, Chicago.
Stromberg-Carlson Telephone Manufacturing company, Chicago.
Sterling Electric company, Chicago.
Farr Telephone and Construction Supply company, Chicago.
Schmidt & Bruckner, New York.
De Veau & Co., New York.
Phoenix Electric Telephone company, New York.
Viaduct Manufacturing company, Baltimore.
Williams & Abbott Electric company, Cleveland.
Holtzer-Cabot Electric company, Boston.
Utica Fire-alarm Telephone company, Utica, N. Y.
Central Telephone and Electric company, St. Louis.
Standard Telephone and Electric company, Madison, Wis.
Pennsylvania Electric company, Lancaster, Pa.
Mason Telephone Pay-station company, Ludington, Mich.

The first four are controlled by Mr. Burns, and one of them is a battery company. Of the remaining 16 concerns six have already positively denied that they have entered the combination, one (De Veau & Co.), in the absence of the manager, was unable to give an answer, and others are undecided as to what position they will finally take. This would indicate that not more than 10 companies, including the Victor, had joined the Burns interests in this movement.

In response to an inquiry from the Western Electrician, six of the largest companies mentioned denied positively that they had entered into the combination, as will be seen by the following statements from representatives of these interests:

Holtzer-Cabot Electric company, Boston: This company has entered into no agreement with the trust, nor given any options.

Stromberg-Carlson Telephone Manufacturing company, Chicago: This company has not joined the combination, but has emphatically declined to do so.

Standard Telephone and Electric company, Madison: We have not entered the trust, nor have we seriously considered the matter.

Western Telephone Construction company, Chicago: The Western Telephone Construction company has not entered into any agreement to go into any combination or consolidation.

Sterling Electric company, Chicago: We are not looking for a purchaser for our business. We are too busy to consider the question of consolidation.

Farr Telephone and Construction Supply company, Chicago: We have given no one authority to use the name of our company in connection with this movement, as we have never entertained any thought of joining a trust or going out of business.

The promoters of the combination have endeavored to create the impression that the principal interests involved in the independent field had joined the movement and that 85 per cent. of the apparatus manufactured for independent exchanges was made in the factories that would be controlled by the trust. This view is entirely erroneous. The following list includes the concerns that have not entered the so-called trust. It does not, however, include the numerous companies making and selling batteries to independent exchanges:

MANUFACTURERS OF TELEPHONE APPARATUS NOT IN THE "TRUST."

Automatic Telephone Switch company, Parker, S. D.
Automatic Telephone Exchange company, Washington, D. C.
American Hard Wood Manufacturing company, Grottoes, Va.
Boardman-Tucker company, Boston.
Bauerle & Stark, Chicago.
Fisher-Taylor company, Ravenna, O.
George C. Bell Manufacturing company, La Crosse, Wis.
Cosmo Electric company, Chicago.
Cleveland Telephone Exchange company, Piqua, O.
Cabinet Manufacturing and Supply company, Cleveland, O.
Chicago Telephone Supply company, Chicago.
Connecticut Telephone and Electric company, Meriden, Conn.
Century Telephone company, Boston.
Central Manufacturing company, Chattanooga, Tenn.
S. S. Creider, Sterling, Ill.

Chicago Electric Manufacturing company, Chicago.
Danbury Electric Works, Danbury, Conn.
Detroit Switchboard and Telephone Construction company, Detroit.
Decker Automatic Telephone Exchange company, Oswego, N. Y.

Erskine Telephone company, McConnellsville, O.
Ericsson Telephone company, New York.
Eastern Electric company, Tonawanda, N. Y.
Electro Manufacturing company, Brooklyn.
Eureka Electric company, Chicago.
Eastern Telephone Manufacturing company, Meriden, Conn.
Electrical Appliance company, Cincinnati.
Farr Telephone and Construction Supply company, Chicago.
H. M. Fisk Manufacturing company, Wheaton, Ill.
Garl Electric company, Akron, O.
Gilliland Electric company, Adrian, Mich.
A. Y. Gordon, Massillon, O.
Holtzer-Cabot Electric company, Boston, Mass.
Hunnings Telephone company, Elkhart, Ind.
Holyoke & Holyoke, Chicago.
Hammacher, Schlemmer & Co., New York.
Hipwell Manufacturing company, Allegheny, Pa.
Indianapolis Electric company, Indianapolis.
D. A. Kusel Telephone and Electric Manufacturing company, St. Louis.
Kokomo Telephone and Electric Manufacturing company, Kokomo, Ind.
Kellogg Switchboard and Telephone Supply company, Chicago.
Logansport Telephone Manufacturing company, Logansport, Ind.

McDermid Manufacturing company, Chicago.
George M. Mayer, Chicago.
Charles Martin, Detroit, Mich.
Moon Manufacturing company, Chicago.
J. H. McFarlan & Co., Flint, Mich.
Mianus Electric company, Mianus, Conn.
Maryland Telephone Manufacturing company, Baltimore, Md.
Maryland Electric company, Hagerstown, Md.
George F. Mims, Edgefield, S. C.
Menominee Electrical and Mechanical company, Menominee, Mich.

William J. Murdock & Co., Boston, Mass.
Northwest Engineering company, St. Paul, Minn.
National Telephone Manufacturing company, Boston, Mass.
North Electric company, Cleveland, O.
National Automatic Telephone company, Chicago.
E. J. Nohlet, Chicago.
Phoenix Telephone Manufacturing company, Chicago.
Pennsylvania Telephone company, Philadelphia.
Rawson Electric company, Elyria, O.
E. Rubel, St. Louis.
O. H. Rugh, Rock Island, Ill.
Rousseau's Electric Works, New York.
Reliable Electric Manufacturing company, Worcester, Mass.
Russell Tomlinson Electric company, New York.
Standard Telephone and Electric company, Madison, Wis.
Stone City Telephone Manufacturing and Construction company, Joliet, Ill.
Swarts' Switchboard and Electric company, Knoxville, Tenn.
Smith-Vasson Telephone company, New York.
Stromberg-Carlson Telephone Exchange company, Chicago.
Simplex Interior Telephone company, Cincinnati, O.
Southern Telephone company, Fayetteville, N. C.
Stromberg-Carlson Telephone Manufacturing company, Chicago.

Sterling Electric company, Chicago.
Springer Electric company, McCordsville, Ind.
Taber & Mayer, Boston.
J. W. Thomson, Jr., & Co., Mitchell, Ind.
Tucker Electric Construction company, New York.
Telephone Manufacturing company, Sumner, S. C.
W. S. Tobie, Augusta, Ill.
Union Electric company, Cleveland.
H. C. Underwood Manufacturing company, Wabash, Ind.
United States Automatic Telephone company, New York.
Western Telephone Construction company, Chicago.
Whitman & Couch, Boston.
W. F. Warner company, Muncie, Ind.
Wilhelm Telephone Manufacturing company, Buffalo.
M. B. Wheeler Electric company, Grand Rapids, Mich.
Williams Electric company, Cleveland, O.

DEALERS IN TELEPHONES AND TELEPHONE SUPPLIES NOT IN THE "TRUST."

Julius Andrae & Sons company, Milwaukee.
American Hard Rubber company, New York.
Allen-Hussy company, Chicago.
E. Bissell & Co., Toledo.
Electrical Engineering company, Minneapolis.
Gay & Thwaites, Philadelphia.
Harvard Electric company, Chicago.
Harrison Bros. & Co., Philadelphia.
Matthias Klein & Son, Chicago.
McFell Electric company, Chicago.
Mississippi Telephone company, Hazlehurst, Miss.
Manhattan Electrical Supply company, New York.
C. H. McEvoy, Lowell, Mass.
National Automatic Fire Alarm company, New Orleans, La.
Plummer, Ham & Richardson, Worcester, Mass.
J. D. Randall, Memphis, Tenn.
St. Louis Electrical Supply company, St. Louis, Mo.
Stanley & Patterson, New York.
Thermo-electric company, New York.
Varley Duplex company, Jersey City, N. J.
S. S. White Dental Manufacturing company, Philadelphia.

Mr. Blaine authorized the statement that the combination would adopt a liberal policy in dealing with the exchanges and that it would encourage new enterprises and assist those already formed to extend and improve their properties. Eventually, it was hoped, a comprehensive toll-line system would be established, connecting independent exchanges and affording means for subscribers of a local exchange in one place to communicate with those of an adjoining town. Construction work would be undertaken when necessary to insure good service. The most important work to be undertaken is the standardization of telephone apparatus. This, the new company announces its intention to do. Mr. Blaine said that two prominent banking houses, one in New York and the other in Chicago, would underwrite the securities of the new company. He also volunteered the statement that "spot cash" was paid for all the plants taken over. This statement is not entirely in harmony with the reports of companies that were approached in connection with this consolidation.

Mr. Burns confirmed the announcement of the policy of the new company as outlined by Mr. Blaine. He said, however, that no official statement could be given out until the corporation was formed and permanent organization effected, as the officers in charge might modify the plans. It was the intention of the promoters of the company, he declared to give the business a recognized standing in the financial world, which individual plants could never hope to attain.

Annual Meeting of the American Bell Telephone Company.

[Special dispatch to the Western Electrician.]

Boston, March 28.—The annual meeting of the American Bell Telephone company was held in this city to-day. The numerical attendance was small, as usual, but the stock was almost entirely represented.

The annual report of the president, John E. Hudson, contained a satisfactory statement of the condition of the company's business. It showed an unprecedented improvement in many important particulars. The net earnings were \$4,393,966, which is equivalent to nearly 17 per cent. on stock outstanding. The dividends paid during the year amounted to 15 per cent. The growth of the Bell interests during the last year was the greatest in the company's history. New construction work was completed by companies sustaining contract relations with the parent company that amounted to a cash valuation of \$12,105,921. Upward of \$1,000,000 was expended for real estate during that time. The list of subscribers to Bell exchange service throughout the country received more than 80,000 names in 1898, and the toll-line systems were extended to the extent of 61,000 miles of wire.

In the treasurer's report it was shown that the earnings for 1898 were \$5,548,701, as against \$5,130,844 for 1897. The expenses for 1898 were \$1,054,734, against \$961,170 for 1897, and the net earnings \$4,393,966, against \$4,169,674. Regular dividends paid in 1897 amounted to \$3,106,356, an increase of \$166,452, while extra dividends declared in 1898 were \$776,589, an increase of \$33,545.

During the meeting the subject of removal of offices to New York was not mentioned, and there was no official statement made upon the subject, although it was discussed by individual stockholders before and after the regular meeting.

President Hudson, Treasurer Driver and Clerk Hubbard were re-elected, and the old board of directors was also continued for another year.

The meeting was harmonious, and the impending competition and adverse legislation that is threatened in many quarters did not seem to worry the stockholders.

J. S. B.

New England Telephone Notes.

[From the Boston correspondent of the Western Electrician.]

The New England Telephone and Telegraph company has issued notice that the outstanding bonds of the first series, dated April 1, 1889, numbered from 1 to 500 inclusive, will be paid at the office of the treasurer in Boston April 1st. Holders of bonds of the second series, payable April 1, 1900, are also notified that the company will receive tenders, in writing, for the surrender of the bonds numbered from 501 to 1,000 inclusive on the date of payment of the first series, and will accept 50 thereof for redemption and payment on that date. But in no case will more than \$1,020 and accrued interest be paid on any of the bonds.

Beginning April 1st the Southern New England Telephone company will reduce the rate for a single-circuit business from \$120 per annum to \$100. This will make a reduced rate in Hartford, Waterbury, New Haven and Bridgeport, in Connecticut. Friends of the new telephone company, known as the Boston and New York Telephone company, which is seeking to do business in that section, claim that the reduction is intended to head off competition.

The directors of the New England Telephone and Telegraph company have declared a dividend of \$1.50 per share, payable May 15th. The company has also sold \$500,000 debenture bonds, dated April 1, 1890, and payable April 1, 1910, to Adams & Co., interest being stated at five per cent.

The Massachusetts Telephone and Telegraph company is making an active canvass in Boston and vicinity for subscribers to the new service, which will be established under the franchise granted recently by the Boston and Cambridge city governments. The subscriber is required to take a five-year contract, but the prices are lower than the established company in this section has been charging.

Russian Telephone System.

The Revue d'Orient of Budapest says: "The Central Administration of Posts and Telegraphs of Russia intends to proceed during the current year with the construction of a direct telephone line between Moscow, Varsovic, Kiev and Odessa. It will be thus possible to communicate directly between St. Petersburg and Odessa. This is really marvelous, when we consider the enormous distance which separates Odessa from St. Petersburg."

Appeal Against the Citizens' Telephone Company Dismissed.

In the suit on the Gilliland patent, No. 266,806, brought by the Western Electric company of Chicago against the Citizens' Telephone company of Grand Rapids, Mich., the plaintiff, on March 27th, dismissed its appeal from the decision of Judge Sevens.

Telephone News from the Northwest.

[From the Minneapolis correspondent of the Western Electrician.]

The Wisconsin Telephone company announces a cut to \$1 per month for residence service at Janesville, Wis. The cut will probably be met by the home company, which is just completing a system and has 500 subscribers pledged for five years.

The Michigan Telephone company is purchasing a right-of-way for a long-distance line between Menominee, Mich., and Marquette.

A telephone line will be built between Mercer and Adel, Ia., as soon as the weather will permit.

It is rumored at Fargo, N. D., that the Northwestern Telephone Exchange company may erect a building there for its exchange.

There will be some extensive improvements made to the telephone exchange at Billings, Mont., in the spring. The list of subscribers has grown under Manager Hungerford from 42 in 1895 to 121 now. A switchboard of 200 drops is about to be put in. Mr. Hungerford also has a franchise for an exchange at Miles City, Mont., and has about decided to put in a system.

The telephone office at Belknap, Ia., was burned out.

An exchange, with 30 telephones, has been installed at Titonka, Ia. This town has grown up in three months.

The Duluth Telephone company announces that it will have long-distance connection between Duluth, Minn., and Ashland, Wis., by July 1st. Work will be begun as soon as the frost is out of the ground.

The Monroe County Telephone company of Sparta, Wis., has completed a toll line to Oil City. Numerous other extensions are projected for spring.

The Gilmore City (Ia.) Telephone company is preparing to install an exchange.

The Mesaba Telephone company of Sparta, Minn., contemplates extending its wires to McKinley and Bivabik, Minn. Later connection will be made with Duluth.

The Standard Telephone company is an applicant for a franchise at Dubuque, Ia. The Iowa Telephone company is working to keep the newcomer out. The council is being bombarded with statements of the unpleasant features of having two telephone systems in the same city.

Fargo, N. D., is said to lead all other towns of its size in the world in the number of telephones in use and the calls made. It has 583 instruments in use and averages 6,000 calls daily.

J. B. McBride has sued the Sunset Telephone company, at Tacoma, Wash., for \$25,000 damages for the non-delivery of a message to him at Jerome, Ariz., stating his daughter was dying and in need of funds. The message was sent to J. B. Upright and was not delivered.

The Mississippi Valley Telephone company announces it will have its system in operation in Minneapolis by June 1st.

A telephone line is to be constructed between Amboy, Minn., and Sterling Center.

G. E. Merrill is working to secure sufficient subscribers to establish a telephone exchange at Verdale, Minn.

Senator McGowan has introduced a bill in the Minnesota Senate for the taxation of telephone, sleeping-car, telegraph and express companies. The bill requires the companies to file in July of each year a statement of their business and the extent of their property. The State Board of Equalization then assesses a tax equal to the average taxation rate in the state.

Brookings, S. D., will vote on \$5,000 bonds for telephone and electric plants in the spring.

J. C. Crowley, Jr., has severed his connection with the Eau Claire (Wis.) Telephone company and taken a position with the Stromberg-Carlson company in Chicago.

Business men of Melrose, Minn., have formed the Merchants' Telephone company and propose to construct a line between Melrose and Meire Grove. The system will be extended as rapidly as possible.

The Northwestern Telephone Exchange company has filled its new switchboard, recently put in at Winona, Minn., and has ordered another board. The present board has 500 drops.

The Southern Electric Telephone company of Minneapolis has been incorporated by officials of the Minnesota Central Telephone company of Willmar, Minn., and of the Union Electric Telephone company of Waucoma, Ia. The capital stock is \$30,000.

PERSONAL.

A. L. Waterbury of Houston, Texas, spent several days in Chicago recently, looking into telephone matters.

P. Yensen has been appointed general manager of the Cleveland Telephone company, in recognition of his efficient development of the company's system.

Charles Webster, vice-president and general manager of the Western Electric telephone system, was a Chicago visitor last week. Mr. Webster's headquarters are at Waucoma, Ia., and his telephone system includes the Union, Western Minnesota, Minnesota Central, Northern Minnesota and Western Electric Telephone companies.

J. P. McKinstry has been elected vice-president of the Northwestern Telegraph and Telephone company, which operates exchanges in Minnesota, North and South Dakota, Arkansas and Texas. Mr. Me-

Kinstry has been vice-president of the Cleveland Telephone company for some time, and was recently elected vice-president of the Michigan Telephone company. The companies mentioned comprise the Eric system, which is the largest operating telephone company in the world. The Eric company, on January 1, 1899, had 57,455 subscribers and 12,668 miles of pole line. Mr. McKinstry's headquarters are in Cleveland.

Bell Securities Increased.

An important step was taken by the Bell interests at Albany, N. Y., on March 27th, when the American Telephone and Telegraph company filed a certificate announcing an increase of capital stock from \$25,000,000 to \$75,000,000. The statement shows that the company has already \$23,500,000 stock issued and that its liabilities amount to \$902,736. No explanation is offered by the officers of the company for the extraordinary increase mentioned, and it has been suggested that it is the intention to change the present relations of the several Bell corporations so as to make the present long-distance company the chief factor in the scheme. This would be in keeping with the plans that have often been discussed of bringing about a closer union of the Bell properties.

The American Bell Telephone company, chartered under the laws of Massachusetts, is the parent of the American Telephone and Telegraph company and the numerous Bell exchange companies throughout the country. The American Telephone and Telegraph company has control of the long-distance telephone system of the Bell company.

In financial circles the explanation is advanced that the purpose of the increase is to absorb the parent concern, the American Bell Telephone company, so that the latter could work under the liberal and elastic charter which the American Telephone and Telegraph company holds in New York. The corporation laws in Massachusetts are strict and rigidly enforced, and several times the Bell company has had considerable trouble in carrying out its plans. One example of the friction that has been caused by the enforcement of the Massachusetts laws is recalled by the step taken at Albany on Monday. In June of 1894 the American Bell Telephone company secured the passage of a bill by both branches of the Massachusetts Legislature permitting it to increase its capital stock to \$50,000,000 from \$20,000,000, an increase of 250 per cent., but when the measure was presented to Governor Greenhalge he promptly vetoed it on the ground that it was a stock-watering scheme, saying that there was no reason why the company should be exempt from the Massachusetts laws as to stock watering. At that time and at frequent intervals since then the company has threatened to withdraw from Massachusetts and establish headquarters elsewhere in order to take advantage of more liberal laws regulating incorporations.

Competition in Connecticut.

[From the Waterbury, Conn., American.]

Beginning with the first of April the Southern New England Telephone company will reduce the price of local service for private wires from \$120 to \$100. This cut is made to head off the threatened competition of the Boston and New York Telephone company, which is planning to establish a telephone exchange here with lower rates for telephone service the coming summer. The new company will furnish private-wire service for \$48 a year and business-wire service for \$25. The Southern New England company is now furnishing similar service for \$120 and \$75 a year, respectively. The cut in rates which the Bell company will make in April will effect private wires only. It is probable, however, that other reductions in rates will be made if found necessary to retain control of the business.

A newspaper dispatch from Winsted, Conn., dated March 22d, says: "Independent telephone companies, with lines in New York, Massachusetts and this state, have decided to connect with one another and compete with the Southern New England Telephone company, the Connecticut branch of the Bell company. The independent companies have a capital of \$100,000. Capitalists in Boston, Providence, Worcester, Springfield, Hartford, New Haven and Meriden have applied for franchises to establish telephone systems in those cities, and in some cases the rights have been granted. The independent companies' rates are 50 per cent. lower than those of the Southern New England company."

Central Union Securities.

The Central Union Telephone company of Chicago decided some time ago to issue \$6,000,000 of five per cent. gold bonds accruing in 20 years. Of this bond issue \$2,500,000 will be held in the treasury to retire the first-mortgage six per cent. bonds which are subject to call at 105 on any interest day after January 1, 1909. There will be issued at once \$1,000,000 of these bonds, the proceeds of which will be used in extensions and betterments. The remaining \$2,500,000 will be held for future extensions and improvements. These consolidated bonds are second lien upon the property of the company, but on the retirement of the first-mortgage bonds as provided in the plan of the issue they become a first security.

NEW COMPANIES.

The Axtell (Mo.) Telephone company has been incorporated with a capital of \$2,500 by George Delaney and associates.

The Prairie Queen Telephone company of Edgerton, Wis., has been organized. All of the incorporators are Scandinavians.

The Virginia and Little India Telephone company of Little India has been incorporated in Illinois, with capital stock placed at \$600, by Marquis L. Crum, Frank Virgin and L. L. Fox.

A new telephone company has been organized at Concord, Mich., to be known as the Concord Telephone company. The capital stock is placed at \$5,000, \$1,700 of which is already paid in. At the last meeting of the Village Council a 25-year franchise was granted. All the stock is owned by business men of Concord and farmers in the immediate vicinity, and the work of constructing the system will be commenced at once. The lines will extend about the village of Concord and connect surrounding towns.

TELEPHONE LITIGATION.

The question whether a telephone company is bound either by common law or statute to furnish service equally and impartially to an individual or corporation who might apply for it was argued in the Appellate Division at Albany, N. Y., on March 16th. The appeal was made by the Onida Telephone company against the New York Telephone and Telegraph company, because the latter refused to place one of its instruments in the office of the plaintiff. The court sustained the demurrer of defendant upon the ground that mandamus proceedings are not the proper legal steps in the premises, but did not pronounce on the question at issue.

Argument was heard in Philadelphia on March 14th by Judges Acheson, Dallas and Kirkpatrick in the United States Circuit Court of Appeals on the appeal of Millheim Electric Telephone company and others of Millheim, Pa., from the decision of Judge Buffington, in the United States Circuit Court of Pittsburg, in favor of the Western Electric company of Chicago. The lower court had upheld the validity of the "bridging" patent issued to John J. Carty, which it was claimed the defendants infringed. The defenses are that the alleged improvements claimed in the patent in suit did not amount to a patentable invention, and that it has not been infringed. Decision was reversed.

MISCELLANEOUS.

During the meeting of the independent telephone companies of Ohio at Cleveland recently a letter was received from J. P. McKinstry, representing the Bell interests, inviting the independent managers "to visit the main exchange of the Cleveland Telephone company at such time during your stay in the city as may best suit your convenience. Upon being advised of the time of your visit a suitable escort will be in readiness to attend you."

Commenting upon the proposition to introduce government telephone service in England in competition with the National Telephone company, the Boston News Bureau makes the following statement concerning the financial aspect of the case: "This government scheme for developing telephonic competition has had for result a sharp fall in the prices of the National Telephone company's securities. The proposition of three months ago to buy out the National Telephone company on the basis of the average prices of its securities during the preceding three years was deemed extravagant. This basis would have been on a value of \$34,250,000 (calling it \$5). The value to which said securities declined under that proposition was \$29,045,000. The decline in market prices since the government's scheme has been proposed has been to a value of about \$27,500,000."

TELEPHONE LEGISLATION.

The bill providing for a reduction of telephone rates has been rejected by the Tennessee Legislature.

The Chicago City Council is considering a resolution requesting the Chicago Telephone company to enclose all public telephones with sound-proof booths to insure privacy to users of these instruments.

Telephone subscribers in New York failed to gain relief from the Legislature in the matter of regulating telephone charges. On March 22d the Senate killed the only bills lowering telephone charges, those of Senator Marshall and of Senator Wagner, which had any prospect of receiving favorable action. Senator Marshall's bill provided that the state controller, the attorney-general and the state engineer should establish telephone rates, after careful investigation of their justice and injustice, except that the maximum rate in New York should not be above \$125 a year; in cities between 100,000 and 500,000 population \$48 a year, and so on down the scale. Senator Wagner's bill declared that it should be unlawful for a telephone company in New York to charge a subscriber more than \$50 for any number of messages less than 1,000 transmitted in one year, or more than five cents for each additional message. The

Senate committee on miscellaneous corporations reported both the bills adversely. Senator Marshall at once moved to disagree with the unfavorable report, and made a speech in support of his favor, depicting the unjust charges of the telephone companies. The Senate rejected Senator Marshall's motion to disagree with the adverse report by 15 to 34. This was substantially a vote on the bill itself, for the rejection of Senator Marshall's motion killed the measure, and the adverse committee report was then adopted without a division. Senator Wagner made the same motion to disagree with the adverse report upon his bill, and made a speech, arguing that his bill was a just one. His motion to disagree with the adverse report was defeated by a vote of 18 to 32.

In the New Jersey Legislature on March 20th Mr. Marks presented a resolution, which was defeated by a vote of 20 to 35, providing for the appointment of a special committee of five to investigate the earnings, rates, charges, expenses, cost of maintenance and other matters concerning the public welfare in connection with all individuals, corporations and associations owning, leasing or operating telephones in this state, the committee to have full power to investigate the telephone companies and report to the governor the result of the investigation, together with any proposed legislation and such recommendation as in its judgment the public interests require in the premises, and that the report be transmitted by the governor to the next Legislature, to the end that proper legislation may be enacted to safeguard the interests of all concerned.

MANUFACTURERS AND DEALERS.

Holyoke & Holyoke, manufacturers of telephone switchboards, Chicago, report a large increase in their business. This firm has recently doubled its force and is located in new and commodious quarters, at the southeast corner of Clinton and Van Buren streets. It has recently shipped one of its switchboards to British Columbia.

The Varduct Manufacturing company is turning out large quantities of its regular telephone sets and great numbers of standard magneto bells. Its factory is running full time on telephone work, district telegraph messenger call boxes, and on specially constructed telephones for railway use. Since the consolidation of a great many of the street railways, it has been found important to have a good signal apparatus to facilitate the movement of cars, and this company supplies a special outfit for the purpose.

EXTENSIONS AND IMPROVEMENTS.

The Bell company does not admit visitors now at the Detroit exchange.

It is expected that a telephone line will be extended from Albion, Idaho, to Elba and Almo.

S. P. Haney is constructing a telephone line from Ione, Ore., to Gooseberry, a distance of 18 miles.

The Southwestern Telegraph and Telephone company contemplates erecting a telephone exchange at Sherman, Texas.

Right-of-way has been secured for a new state telephone line from Jackson to Lansing. There will also be a station at Leslie.

The private telephone line between Columbus and Sugar Grove, O., operated by the Columbus Natural Gas company, is to be reconstructed, and 47 miles of new wire will be strung.

The Michigan Telephone company has recorded a mortgage aggregating \$5,000,000 at Bad Axe. It required \$2,500 in revenue stamps. Another mortgage for the same amount was filed at Owosso.

The Sunset Telephone and Telegraph company has volunteered to furnish telephones for the police-signal service at Los Angeles, Cal., for \$5 per year instead of \$7.50, and to rent the loop wire at \$1.50 instead of \$2.50.

The City Council of Houston, Texas, has granted a 15-year franchise to A. L. Waterbury and W. Bucklin, Jr., for a telephone exchange in that city. They have accepted the ordinance and deposited \$10,000 with the city treasurer to insure the prompt execution of the contract.

The People's Telephone company of Wilkesbarre, Pa., recently expended \$50,000 for apparatus with which to equip its system. The line is expected to be in operation by July 1st. Poles are being placed, and the work of laying the underground wires will begin as soon as all the frost is out of the ground. The number of subscribers is nearly 600.

A representative of the Trans-state Telephone company of Philadelphia has been in Cincinnati soliciting subscriptions for that company as a competitor of the Bell interests. An ordinance has been presented to the Board of City Affairs providing for a franchise. The same company has commenced operations in Springfield and Columbus, O.

H. A. Everett of the United States Telephone company is after the franchise to operate in Columbus, where the Bell company occupies the ground. He stated that the roof would be on the Cleveland telephone building which the Cuyahoga Telephone

company is erecting by July, and the Cleveland system would be in operation in the fall. "We are doing much inside work now, wiring buildings," said Mr. Everett.

R. A. Knight, counsel for the Massachusetts Telephone company, asked for a franchise in Springfield, Mass., on March 21st. G. S. Halbrooke, whom he introduced, said the company would furnish connection with New York and the West 50 per cent. cheaper than was given by the Bell interests. Judge Long, in behalf of the New England Telephone company, opposed the granting of a franchise. The Board of Aldermen took the matter under advisement.

The establishment of a comprehensive system of local independent telephone lines, all interchanging business, is now being completed in Western Pennsylvania, and will form the nucleus of an anti-Bell system. The work of connecting the lines has begun, and the new system will shortly be in use throughout Pittsburg, Allegheny and the surrounding territory within a radius of 50 miles. The Pittsburg and Allegheny Telephone company is the name of the principal concern, and the following towns will be included in the new system: McKeesport, Braddock, Carnegie, Greensburg, Uniontown, Connellsville, Canonsburg, Oakmont, New Kensington, Parnassus, Verone, Homestead, Sewickley and Macdonald. This system is to be extended westward and north to Cleveland, to connect with the lines of the United States Telephone company of Cleveland, the big anti-Bell concern which proposes to build long-distance lines between a number of large cities and ultimately secure connection with Chicago.

Electric Street Lighting.

[Continued from page 183.]

play lighting only in the business section and a milder one for the residence portion. To-morrow we may look for a mild but uniform illumination, both

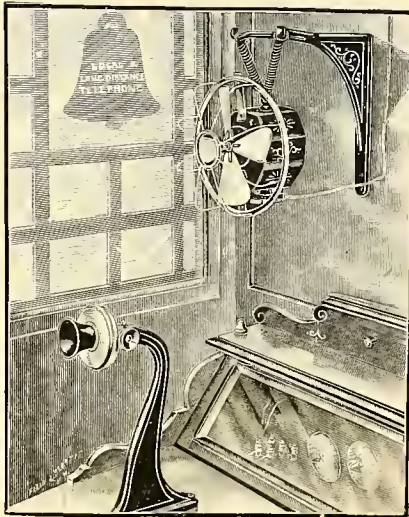


FIG. 2.

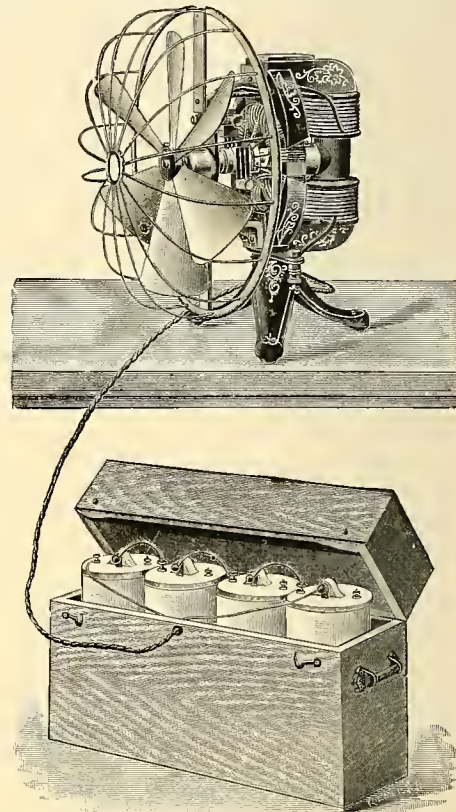


FIG. 1.

for the residence district and for the business portion after midnight.

Yesterday the lower efficiency of the incandescent lamp kept it back. To-day our ability to distribute light more uniformly with the incandescents has caused them to be used in many places, and to-morrow we may look for small arcs or incandescents of higher temperature (and therefore higher efficiency) to bridge the gap.

Yesterday the naked arc, being all the more dazzling, was welcome. To-day enclosing globes are mellowing the effect on the eye. To-morrow the use of naked arcs out of doors and less than, say, 30 feet above the ground ought to be prohibited by law.

Yesterday only large cities felt the need of street lighting. To-day even towns with a population of less than 1,000 have their streets electrically lighted.

Yesterday a thousand towns secured the advantages of electric light and power by giving lighting contracts at a fair profit to proposed plants. To-day the same towns begrudge the help they have given toward modernizing their city, hesitate to pay even the actual cost for lighting by contract, and make the central stations look to the sale of exhaust steam and like sources of extra revenue.

Yesterday towns were lighted either with arcs or incandescents. To-day both are used in the same city, each in its proper place. To-morrow we may have some lamps of intermediate candle power (perhaps semi-incandescents of the Nerst or allied types) to supplement the arcs and incandescents.

Yesterday every circuit of one or two dozen arc lamps required its own generator. To-day we have from 100 to 200 run from a single generator, and to-morrow we may have four or five hundred arcs (or the equivalent of part of them in incandescents) all run from the same alternator.

Yesterday a circuit of a thousand volts was hard to insulate, and might have to be shut down during rainstorms. To-day we have circuits of 7,000 to

8,000 volts giving uninterrupted service, in spite of wind and weather.

Yesterday little attention was paid to the fittings as long as the lamps, dynamos and circuits were all right. To-day they must be firm and durable. To-morrow the lamps, supporting fixtures and all parts of the circuit will need to be good-looking.

Last, but not least, electric street lighting has become an object of careful study and is receiving skilled attention. Yesterday the size and distribution of lamps and the methods of supporting them were determined chiefly by the salesmen of the firms supplying the material. To-day such organizations as the American Society for Municipal Improvements and the National Association of Municipal Electricians are making a serious study of street lighting in its general bearings and are getting back to due consideration of the prime objects of all street lighting—path finding and crime preventing. What is more, while some manufacturers and consulting engineers have made a specialty of long-distance power transmission, others of the lighting system for modern buildings, and still others of the applications of electric motors to special classes of machinery, we also have some who have been studying the problems of electric street lighting. It is only by such special study, both on the part of the engineers in charge of the work and of the makers of

the needed devices, that we can expect to raise the present standard of effectiveness of our street lighting. And I think it is high time that both the general public and our electrical fraternity were made aware of the importance of these problems, so as to help us all in having electricity become by far the best means for properly lighting our outdoor pathways.

Fan-motor Outfits.

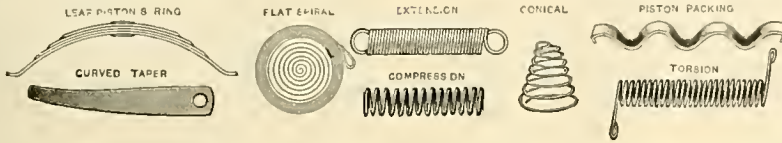
The problem of designing a fan motor that is both efficient and economical when run by battery power is one of much importance. The Edison Manufacturing company of New York and Orange is placing on the market several fan outfits that are superior to anything it has produced up to the present time. The ironclad outfit carries a seven-inch fan with a guard and is operated by a battery of three Edison Lalande cells. The speed is about 1,200 revolutions a minute. The motor is efficient, and the battery will run for 150 hours before needing to be recharged. The nine-inch Edison fan motor, shown in Fig. 1, has been greatly improved this season. The motor is much more efficient and will run at about 900 revolutions a minute on a little less than two amperes of current when using the battery supplied with it, consisting of four Edison Lalande cells in a polished oak case.

The greatest attention has been paid to the elimination of all unnecessary friction in the moving parts, and the motor now placed on the market is said to be the most efficient battery motor that has yet been constructed. The company has also a nine-inch fan motor similar in construction to the battery fan motor, and is wound for 110-120-volt direct-current circuits. It is provided with three speeds—1,400, 1,600 and 1,850 revolutions per minute.

An improved and convenient outfit for use in a

telephone booth is a late novelty exploited by this company. Its use is not limited to any time or season, as every telephone booth is apt to be close, hot, ill-ventilated and uncomfortable at all times. Its many points of superiority have won for it great favor from a large number of New York firms who have used these fans. It has also been indorsed by the Long-distance Telephone company and several of the local Bell Telephone companies, who are using it quite extensively. The outfit, as shown in Fig. 2, is designed for use with either 110-120-volt direct current or a primary battery. It is said to be noiseless and to produce no vibration—two important features for recommending it for the use for which it was designed. It has self-aligning, self-oiling bearings and is suspended by a double spiral spring from an ornamental bracket easily adjusted to the interior woodwork of a telephone booth.

In motors for the 110-volt circuit connection is made from the stop-and-start switch on the motor by means of the connecting cord to the nearest



THE CARY SPRINGS.

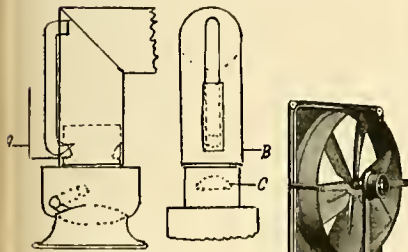
electric light. The lamp bulb is unscrewed from its socket and the current tap is inserted. The connecting cord leads to the binding posts on the sides of the current tap. The switch on the motor is so arranged that the lighting of the lamp will start the fan, or the lamp can be lighted without the motor running, if so desired. It costs no more to run both the lamp and the fan motor than to run the lamp only, and as neither need run while the telephone booth is not in use, the economy of the outfit is most apparent.

The Cary Springs.

It is a recognized fact that inquirers for mechanical specialties, Yankee novelties, and even some ordinary devices, are in many cases referred to New York, New England and other eastern manufacturing centers. At present an effort is being made to develop this business in the West, and among the enterprising manufacturers of "mechanical refinements" engaged in this line is the Cary Spring Works of New York city. This company manufactures a full and complete line of springs for machinery, motors, clocks, music boxes and all kinds of electrical purposes, and its springs are said to have always met with universal favor. This concern is sending thousands of springs to Germany and England, and many to the city of Sheffield, which is supposed to be the center of the finest tempered steel in the world.

A New Interlocking Speaking Tube and Whistle.

Electrical contractors will be interested in the new interlocking speaking tube and whistle which is diagrammatically illustrated herewith. This device



A NEW INTERLOCKING SPEAKING TUBE AND WHISTLE.

Telegraphic Extensions in Africa.

The German minister of foreign affairs recently announced in the Reichstag that an agreement had been made between the government and the Trans-African Telegraph company in relation to the construction of a telegraph line in the German East African protectorate as a connection with the existing South African line, in which the German supremacy of interests will be safeguarded. The Trans-African company by this arrangement, he said, receives permission to construct the line at its own cost, the work to be completed within five years. The officers and workmen are to be subject to German laws while in the East African protectorate. The company undertakes, in addition, to build a separate line of two wires between two stations in Rhodesia, nearest to the frontier and British East Africa, which shall be the property of the German government and kept up at the government's expense.

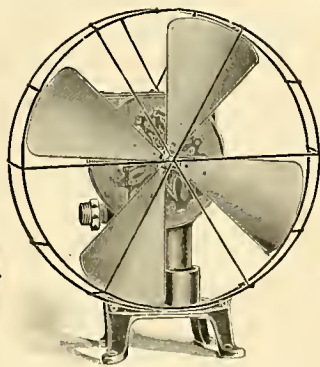
In relation to the proposed extension of the tele-

graph up the Nile to Fashoda, Slatin Pasha, interviewed at Vienna recently, says that the construction will be difficult, owing to the sudden closing of navigation on the Nile. To transport poles and other materials by camels is too costly.

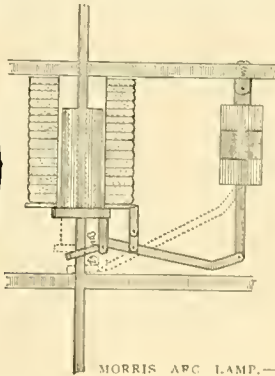
Triumph Power Fans.

The Triumph exhaust fan (Fig. 1), made by the Specialty Manufacturing company of Indianapolis, Ind., presents some novel features. The flat, square back reduces the trouble and expense of placing the fan in position, it only being necessary to bolt or lag the flat back up to the opening, and the fan is ready for service. This fan is said to be the only fan made with perfectly adjustable self-oiling boxes and phosphor-bronze (not babbitt) bearings, thus insuring a fan of the most durable character, as the bearings represent practically the only wearing parts of a fan. The manufacturer claims high efficiency for the Triumph, due to neatly fitted bearings, proper number of blades, correct angle and accuracy in balance, and the maker is willing to ship this fan to any responsible person on 30 days' trial, and simply asks that it be returned if not fully satisfactory. This fan is made for belted service only, as most customers have power of some kind, and if it should be necessary to use an electric motor, any first-class motor and a Triumph exhaust fan complete can be bought and belted together.

The Junior water-blow fan, manufactured by the Specialty company, is shown in Fig. 2. This fan is operated by water pressure. It has its own motor and can be used in cities or towns where a water pressure of 30 pounds or over is attainable. It is neat, attractive, efficient and economical in water consumption, as it requires a jet only one-sixteenth inch in diameter to run it. It is made with ground



FIGS 1 AND 2 TRIUMPH POWER FANS



MORRIS ARC LAMP.—FEEDING MECHANISM.

is manufactured by H. A. Paquette & Co., 53 Dearborn street, Chicago. It has a number of special features. One half of the drawing gives a side view of the whistle and elbow. A is a small covering over the spring which holds the whistle so that plastering cannot come in contact with it. The other half shows the elbow whistle bottom side up. C represents a slot cut in on both sides of the whistle, which is held to the elbow as represented by B. The whistle is so constructed that children and others cannot steal it. The blowing off of the whistle when too much force is used is also an impossibility. Paquette & Co. state that only the best material is used in their device. It might be added that although only recently placed on the market this speaking tube is already in great demand and is said to be recommended by architects all over the country. It will be handled by electrical supply houses as well as hardware dealers.

A stock company has been organized at Hope, N. D., to establish an electric-light plant.

tool-steel shaft and hard-brass bearing, and has 13-inch blades of spring brass, nickel plated and protected with neat wire guard. The body and base are neatly enameled. The fan weighs only nine pounds complete. The inlet is provided with thread to which the ordinary three-quarter-inch hose coupling may be attached, thus enabling the purchaser to fit up this fan with rubber hose for both waste and supply, at a very small cost. The manufacturer of the Junior is the maker of many other water fans, and has placed the Junior on the market in response to a demand for a reliable and serviceable fan at a price that will be within the reach of all.

Morris Arc Lamp.

The Morris Arc Lamp, made by the Morris Arc Lamp company of Chester, Pa., is designed to meet the demand for a long-burning arc lamp for use on constant-potential circuits, constructed without the complicated mechanisms which, to quote the language of the manufacturer, "have been as unnecessary as they are disastrous to every-day use

in the hands of any but expert electrical men." The carbon feeding device of this lamp, which is in the cut, consists of a single column of rigid carbon core of which directly emerges the carbon rod by means of a washer clutch, and sudden movement of the carbon is checked by means of a self-aligning dash-pot, provided with a graphite plunger. There are absolutely all the parts of the feeding mechanism, there being no clockwork, escapements or racks, and in practice it is found to control the arc perfectly, it is said.

These lamps are made for use on all the standard constant-potential circuits, 110, 220 and 550 volts. The lamps constructed for use on 110-volt circuits are for multiple connection with about 80 volts at the arc; those for 220 volts are for either multiple or two in series, and those for 550 volts are for five in series connection. The four cardinal points of merit claimed for the Morris arc lamp are insulation, economy, simplicity and steadiness.

Great care has been devoted to make the insulation perfect, and the liability to burn-out has been almost entirely eliminated. Those having experienced the annoyance and expense attending incomplete insulation in arc lamps will appreciate this point.

The "economy" refers to the cost of operation as well as to the first cost of the lamp. The saving in carbons and time expended in trimming will, it is claimed, more than pay for the lamp in a year.

Simplicity is a very desirable feature and one that will be fully appreciated by those having had experience with the clockwork mechanisms in arc lamps. There are no working parts to get out of order and all the attention required is to trim the lamp and keep the globes clean.

Steadiness is accomplished by patented features controlled by the company. With even voltage there is no jumping of the light, and by the use of proper inner and outer globes there are no shadows.

Electric Lighting in Massachusetts.

The fourteenth annual report of the Massachusetts gas and electric-light commissioners for 1898, just issued, covers the operations of 138 corporations, 68 of which are electric-light companies and 24 others operating gas and electric-light plants combined. The earnings of these companies are summarized separately from those doing a gas manufacturing business only, and compare with 1897 figures as follows:

	1898	1897	Increase.
Gross.....	\$4,841,779	\$4,510,134	\$331,645
Expenses.....	3,030,310	2,838,477	191,833
Net.....	1,732,438	1,621,656	110,782
Deduct gas profit.....	251,247	228,738	22,509
Add other income.....	651,067	95,745	555,322
Balance.....	2,132,258	1,489,664	642,594
Changes.....	1,358,908	641,973	716,935
Balance.....	873,350	847,691	25,659
Dividends.....	697,235	529,523	167,712
Surplus.....	256,115	318,168	*62,053

Cable Communication in the Philippines.

The Signal Service Corps of the United States army is hard at work in the Philippines, and cable communication is being rapidly opened among the islands. On March 22d the War Department at Washington received from General Otis information that came by cable to Manila from Iloilo. The opening of the cable from Manila to Iloilo was announced the day before in a message to General Greely from Manila, which also reported the proposed extension to the island of Cebu. A cable has heretofore run from Manila to Capias, on the island of Panay, and communication with Iloilo was maintained by a land telegraph from that point before the insurgent uprising. The station at Capias has now been discontinued, and the cable has been swung from there around the northeast end of the island of Panay, so that it reaches Iloilo, making a direct line between Iloilo and Manila. General Greely has also been informed that the cable has been opened from Iloilo to Baccolod, on the island of Negros, and it is hoped to open soon the land line from Baccolod, on Negros, to Escalante, from which place a cable extends to Suburan, on the island of Cebu.

Trouble in Syracuse.

The trouble between the city officials and the Rapid Transit Railway company, controlling all of the local surface lines of Syracuse, N. Y., culminated on March 20th in the stoppage of traffic on the entire system. The conflict started last week on account of the refusal of the company to pay certain taxes due the city. The company recently adopted some new rules regarding transfers and the running of cars, which proved unsatisfactory to the public. It was asked by the mayor and Chamber of Commerce to change these rules, but it paid no attention to the request. The mayor then gave notice that he would enforce every ordinance touching the speed of the cars and their sanitary condition, and would bring into effect many laws which have for a long time been considered dead letters. There was a timely snowfall of over six inches, and this gave the mayor an unlooked-for opportunity. In the morning the company had out its snow plows, which resulted in the piling of the snow beside the tracks to a considerable height. An ordinance says that the snow shall be carted away, and this not being done, the commissioner of public works was ordered to get out his men and shovel the snow back

on the tracks. So effectually was this carried out that in less than an hour after the order was issued almost the entire system was tied up. When the motormen and conductors attempted to move their cars they were arrested and taken to police headquarters for violating a city ordinance. All of the cars carried small plows, which would shove the snow from the track as fast as it was shoveled on. The men were afterward released on bail, and were allowed to run their cars into the various barns, but this was as far as they were allowed to go.

CORRESPONDENCE.

New York Notes.

New York, March 27.—An important development in the rapid-transit situation in this city came to light to-day, when the Rapid Transit Commission received an application from the syndicate of capitalists headed by William C. Whitney, offering to construct an underground railway according to the plans prepared by the commission and lease it in perpetuity to the Metropolitan Street Railway company. The board voted to instruct its counsel to prepare an amendment to the rapid-transit act which will empower it to consider and act upon such a proposition. The proposal submitted is that a company shall be organized to build the tunnel, work to begin on the first section, from the city hall, at the southern end of Manhattan island, to Fort George, at the northern end, within three months after the right is acquired, and to be completed within three years from the beginning. The second section is to be built within two years after the first has demonstrated its capacity to earn for the tunnel company five per cent. on the actual cost of construction and equipment. On completion the road is to be leased in perpetuity to the Metropolitan Street Railway company for a yearly rental of five per cent. of its actual cost. The city is to receive from the Metropolitan company five per cent. of the gross receipts of the road, after taxes and the rental to the construction company are paid. The Metropolitan company will bind itself to run express and local cars, the fare on express trains to be 10 cents, entitling persons to transfer to all surface lines. The fare on local cars is to be five cents, and transfers to or from surface lines are to cost three cents extra. It is said that both Richard Croker and Senator Platt are backing the proposed deal with their political influence, and that, therefore, little or no opposition is expected from the Legislature. The Whitney syndicate has almost unlimited capital at its back, and possesses one of the largest power houses in the world, capable of furnishing power to the tunnel trains in addition to that required for its surface lines. The cost of the road has been variously estimated at from \$30,000,000 to \$60,000,000.

The new Park Row building, just completed, is 26 stories high, and it is significant that electric elevators are relied upon where quick, reliable service is so essential.

The students in electrical engineering at the Johns Hopkins University of Baltimore will take a trip in the Easter vacation to New York, Brooklyn and Philadelphia for the purpose of inspecting the working of power houses, machine shops and electrical works. Dr. Hermann S. Hering, instructor in electrical engineering, who lectures upon central-station equipment, will have charge of the party. While in New York, says a Baltimore correspondent of the Tribune, the party will visit three stations of the Edison Illuminating company—the storage-battery sub-station at Bowling Green, the Pearl street station and the Twenty-sixth street station. The students will also go through the large Kent avenue station of the Brooklyn Heights Railway company and the Bay Ridge station of the Brooklyn Edison company. They will also see the Waldorf-Astoria plant, which is said to be the largest private electric plant in the world. In Philadelphia visits will be made to the power house of the Union Traction company and the Baldwin Locomotive Works, where the students will see the large 100-ton electric crane. The Cramp shipyards will also be visited.

The Brooklyn and Brighton Beach railroad, long in the hands of a receiver, was sold under foreclosure last week. The syndicate headed by R. P. Flower, which is attributed with the purpose of consolidating all the railroad interests in Brooklyn and Long Island, bought it for \$711,000. The railroad is to be equipped with electricity before long, and Colonel F. S. Williams, secretary of the Brooklyn Rapid Transit company, says that it will be run on a five-cent through fare to Brighton Beach. The first mortgage bondholders will be paid in full, with interest to date, out of the proceeds of the sale. The holders of both the preferred and common stock of the company will get nothing, both entire issues having been wiped out under the receivership.

Corporation Counsel Whelan gave an opinion to the Board of Public Improvements on Wednesday last that contracts made by town officials in the borough of Queens for lighting, water and public improvements just prior to consolidation are not binding upon the city. The opinion will affect \$2,000,000 worth of contracts. Bridge Commissioner Shea reported that the comptroller had discovered that fraudulent methods were used to get the required number of names on petitions for all sorts of extravagant improvements for which contracts were afterward let. The method was to get signatures for the opening of new roads, and then attach the

names to petitions for additional electric lights, gas lamps and water mains. One of the results was, Mr. Shea said, that some farms in Queens County were better lighted than many streets in Manhattan. M. S.

PERSONAL.

Henry C. Adams, Jr., secretary of the Phillips Insulated Wire company of Pawtucket, R. I., is in Chicago.

Mr. Charles E. Brown, secretary of the Central Electric company, Chicago, has been taking a week's rest in Virginia. He returns with renewed vigor to handle the arduous duties of his position.

Mr. W. R. Mason and Mr. William M. Moran of St. Louis were Chicago visitors early in the week. Mr. Mason is in charge of the St. Louis office of the Siemens & Halske Electric company and Mr. Moran is the engineer of the St. Louis, Belleville and Suburban Railway company.

ELECTRIC LIGHTING.

The council of Prineville, Ore., has granted a franchise to H. V. Gates of Hillsboro, Ore., to furnish and operate an electric-light, power and water-works in the city of Prineville.

The committee appointed to ascertain the cost of an electric-light plant to be owned and maintained by the city of Mendocino, Cal., recommends that the trustees call an election at once to vote on the question of bonding the town for \$18,000 for that purpose.

The High Falls Electric company of Malone, N. Y., has been incorporated to produce electricity for public and private purposes. The capital is \$20,000, and the directors are Joseph F. Wright and Frederick O. Kilburn of Malone and J. Henry Abbott and Morton P. Abbott of Gouverneur.

The Interior Department is inviting sealed proposals, until April 20th, for-furnishing the necessary labor and materials required to construct and complete an electric-lighting system at the Genoa Indian School, Nebraska. Full information will be furnished upon application to J. E. Ross, superintendent of the school, or to W. A. Jones, commissioner of Indian affairs, Washington, D. C.

ELECTRIC RAILWAYS.

Two parties of surveyors are locating the line of the Seattle-Tacoma electric road. The contracts for the bridges will probably be let first. The bridges will be of the latest pattern of steel work.

The Fresno (Cal.) Railroad company, with capital stock of \$500,000, has been incorporated by S. W. Jones, Alexander Gordon, S. N. Griffith and others, to build a road from Fresno to Clovis, with laterals. The road will be 20 miles long and the principal place of business will be Fresno.

Governor Pingree has signed the bill authorizing the city of Detroit to purchase the street railways of the city. A citizens mass-meeting was called to protest against the measure, on the ground that it contains no provision for submitting the municipal-ownership proposition to a popular vote.

The property of the Akron (O.) Street Railway and Illuminating company was sold on March 28th to the reorganization committee, represented by Attorney J. H. Dempsey of Cleveland. The price paid was \$1,050,000, but this was subject to an underlying issue of bonds amounting to \$200,000, so that the real purchase price was \$1,250,000.

Now that satisfactory arrangements with the Jackson aldermen seem to be assured, the 38-mile electric railroad between Adrian and Jackson, Mich., will be built this year. The right-of-way for the whole distance, outside of Jackson, has been secured. The line will be operated summer and winter, and the rate of fare will be 1½ cents a mile, with a minimum of five cents. One power house will be in Jackson.

Judge Swan of the United States Circuit Court for the Eastern District of Michigan has enjoined the Detroit Citizens' Street Railway company from infringing the General Electric company's series-parallel car-controller patent, known as the Condict patent, No. 393,323. The car equipments held to be infringing were sold to the street-railway company by the Steel Motor company. There are about 500 of them, and they must be removed by May 27th.

The Elizabeth (N. J.) Street Railway company has applied for permission to change its motive power from horses to electricity. The company wants to construct its line from the Elizabethport and Staten Island ferry to Cranford township, and have the cars running by June 1st, and if the Elizabeth Council acts promptly this can be done. The intention of Senator Kean is to build the road through to Plainfield, but that part from Elizabethport to Cranford is to be undertaken at once.

A trolley car of the Stratford avenue line of Bridgeport, Conn., pulled into the station at the end of the line recently with William Steadman, the conductor, lying dead on the rear platform. He must have died after the car left the East Main street junction, as the passengers said that he was alive at that place. There was a terrific thunderstorm rag-

ing at the time and the car made no stops for a long distance. The lightning struck in several places and the trolley wires were ablaze along the line as the car passed along. Steadman's death was due to heart disease, but was probably caused by the excitement occasioned by the action of the lightning.

A strike which may tie up every street railway in Cleveland is threatened. The employees of the Big Consolidated company declare that unnecessarily severe rules are being harshly enforced with them, and the men of the Little Consolidated companies, while having no complaints of their own, say they will stand by their fellow-workmen.

A company has been formed by Nassau County (N. Y.) men to operate a trolley road throughout the county. The capital stock is \$300,000. Two lines will be maintained. One will start from Mineola, near the county building, and run through Garden City, Hempstead village, Freeport, Baldwins, Ocean Side and East Rockaway. The route will be through public thoroughfares and private property. The other line will start at Hempstead, and run through Rockville Center and East Rockaway, where it will connect with the other line. A loop will be extended so as to take in Long Beach and Lynbrook, and, altogether, 30 miles of road will be operated.

The Long Island Railway company has let contracts for the equipment of a portion of its suburban system, running between Far Rockaway and Rockaway Park, a distance of seven miles. The trolley system will be employed, and both electric and steam cars will use the same tracks the electric cars running during the intervals between the regular steam trains. At present there is only a single track between the two places, but it is intended to lay a second track and equip both tracks with the overhead wire. There is also in contemplation the extension of the electric system through the streets of Far Rockaway, so as to connect with the electric service on the Long Island road proper.

The people of New York, it seems, are slow in taking advantage of improvements, or, at any rate, of that particular improvement which consisted in placing electric push-button signals on the surface railway cars. "One in authority" is quoted as follows in the *Sun*: "The buttons were put in to accommodate passengers, who are not always able to catch the conductor's eye when they want the car to stop. But thus far the push signal in our system has been a failure. Passengers rush out to find the conductor or grab the bell-rope or sometimes the rod that rings up the fares. There is an electric button at every window. When it is properly used the car will stop at the next crossing."

It is very evident that Hon. W. Caryl Ely of Niagara Falls is to be the official head of the International Traction company, when its organization is perfected. At a meeting of the Buffalo Railway company, held March 24th at the office of J. P. Morgan & Co. in New York city, the following new organization of the company was perfected: President, W. Caryl Ely; vice-president, Daniel S. Lamont; general manager, Burt Van Horn; secretary-treasurer, Richard F. Rankine; directors, Charles H. Coster, T. De Witt Cuyler, Daniel S. Lamont, Francis Lynde Stetson, William B. Rankine, W. Caryl Ely, Burt Van Horn, Henry M. Watson, Cornelius C. Cuyler, Robert L. Fryer, John N. Scatcherd, George Urban, Jr., Daniel O'Day.

A. A. Talmage & Co., New York, are about to incorporate the Michigan Street Railway company and the Michigan Heat, Light and Power company, each with a capital stock of \$25,000, the minimum amount allowable in Michigan. The ultimate capitalization of the company, according to the *Railroad Gazette*, will probably be about \$10,000,000. This company has secured nearly all necessary right-of-way and franchises for 85 miles of electric railroad. The road will begin at Flushing, Shiawassee County, running southeast 12 miles through Genesee County, to Flint, which will be the headquarters of the company; then the road will parallel the Flint and Pere Marquette railroad to Grand Blanc, where two branch lines will be built, one running east to Atlas, the other southwest to Fenton, via Long Lake, probably needing three bridges. From Atlas it is intended eventually to build a line through to Pontiac and connect with an electric railroad to form a continuous line to Detroit. With trackage arrangements with other roads now in operation and building, this new road will pretty well cover the territory between Bay City and Detroit. In Flint about six miles of road will be built to give a local service. The company will do its own building. H. A. Lloyd is president pro tem. Other persons interested are A. A. Talmage, R. D. Talmage and William J. Schaefer.

INDUSTRIAL COMBINATIONS.

The articles of incorporation of the International Steam Pump company were filed on March 17th with the secretary of state in Trenton, N. J. The capital stock is placed at \$27,500,000, and the incorporators are Wilson P. Marchbank, Charles N. King and B. B. Schiff of Jersey City. This is the company formed to take over the business of the steam-pump companies of the country.

It is said that an effort is making to combine the manufacturers of pulleys and other mechanical devices for power transmission. The names of the

companies invited into the combination are given as follows: Reeves Pulley company, Columbus, Ind.; Keasey Pulley company, Toledo, O.; Dodge Manufacturing company, Mishawaka, Ind.; Menasha Pulley company, Menasha, Wis.; Saginaw Manufacturing company, Saginaw, Mich.; Ohio Valley Pulley company, Maysville, Ky.; Buckeye Pulley company, Marion, O.; Fulton Pulley company, Fulton, N. Y.

POWER TRANSMISSION.

Work will be begun at once on the electric plant near San Bernardino, Cal., to be erected by the Lytic Creek Power company, and it is believed that the plant will be in operation by August or September. Judge Campbell has sent a corps of engineers to the canyon to stake a line for pipes and ditches.

The Woodland, Cal., Mail says that E. H. Winship of Napa has made a statement regarding the proposed electric power enterprise. Cache Creek of Lake County will furnish the water power to generate electricity. The turbines will be on same shafts as the dynamos. A pole line will be constructed from the power house, conveying six wires carrying 40,000 volts, along the most feasible route to Calistoga. From there the line divides, three wires going to Santa Rosa and Petaluma and a three-wire line to St. Helena, Napa, Vallejo and Benicia.

Power from the new plant to utilize and electrically transmit some of the force of the Missouri River is now available at Helena, Mont. Immense smelters, concentrators, mining machinery, mine hoists, street cars, electric-light systems, telegraph and telephone batteries, newspaper plants, and, in fact, almost every power plant in Helena, East Helena and Corbin are either now or will be driven by electricity derived from an electrical plant located at Canyon Ferry, 16 miles from Helena. It is the hope of the company to extend the lines to Butte, distant about 40 miles.

The Clear Lake Electric Power company has asked for a franchise to erect, construct, maintain and operate in Solano County, Cal., a system for the transmission of electricity for light and power purposes, and to exercise the privilege of operating electric-light and power plants in the county. The application was received and the clerk of the Board of Supervisors instructed to advertise that the board proposes to grant the application, and will receive bids for it up to 10 a. m. on Monday, May 1st. The same company has made similar applications in Sonoma, Napa and Lake counties, and bids for the franchise in the last-named county will be received by the clerk of the Board of Supervisors at Lakeport, until 1 p. m. on May 1st.

A dispatch from Stockton, Cal., states that after a tour of inspection of the big power line between that city and the Blue Lakes, Chief Engineer F. A. C. Perrine and Foreman of Electrical Construction E. D. N. Lehe of the Standard Electric company have arrived in Stockton. They report the system completed and ready for operation. This power line extends 42 3/4 miles and has aluminum wire. This is the first division of the system, which will be extended to Oakland and eventually to San Francisco, for it can furnish and power at much lower rates than a company compelled to produce its electricity by coal. Arrangements have already been made with the Oakland Gas and Electric company to distribute the power in that city, while all who wish it in the towns through which the line passes will be furnished directly by the Standard Electric company, with the exception of Stockton, which has a distributor.

ELECTRICAL SECURITIES.

The Twin City Rapid Transit Railroad company reports gross earnings for February of \$178,829, an increase of \$27,003 as compared with the same month of last year, and net \$92,304, an increase of \$19,267. Fixed and preferred-stock charges were \$67,529, leaving a surplus of \$24,775, an increase of \$18,788.

President W. W. Gibbs of the Pennsylvania Electric Vehicle company says that the preferred stock is entitled to a dividend of six per cent. upon the amount paid in upon it before any dividend shall be payable on the common stock. After six per cent. has been paid upon the amount paid in or called upon the preferred stock, then six per cent. shall be paid on the par value of the common stock before further dividends or payments are made on the preferred. After six per cent. has been paid upon the amount paid in on the preferred stock, and six per cent. has been paid upon the par value of the common stock, any further distribution of profits will be made, share and share alike. The capital of the company is \$4,000,000 common and \$2,000,000 preferred.

N. W. Harris & Co. of Chicago, having sold \$1,200,000 five per cent. 30-year first-mortgage gold bonds of the Edison Electric company of New Orleans, now offer \$500,000 more at 106 and accrued interest. The company has a capital of \$1,500,000 common stock and \$2,000,000 preferred. It has outstanding \$2,000,000 first-mortgage bonds and \$500,000 are in the treasury reserved for extensions. The gross earnings of the company have increased from \$152,712 in 1894 to \$550,003 in 1898; net earnings in the same period have increased from \$74,150 to \$262,817. The company owns complete control of the electric-

light business of New Orleans. It is said that its plants have been carefully examined by Mr. Samuel Insull, president of the Chicago Edison company, who estimates that the property represents an actual cash investment of \$2,865,000. The income of the Edison Electric company of New Orleans per capita of population is said to be greater than that of any other illuminating company operating in a city of similar size.

The New Jersey Title Guarantee and Trust company of Jersey City, acting as agent for the United Gas Improvement company of Philadelphia, has issued a circular letter to the owners of stock of the North Hudson Light, Heat and Power company, stating the terms upon which the stock of the latter company can be exchanged for bonds of the United Electric company of New Jersey, which was recently incorporated with a capital stock of \$20,000,000. The United Electric company has issued \$20,000,000 of 30-year four per cent. gold collateral trust bonds. The letter says: "The holder of each \$1,000 of the stock of the North Hudson Light, Heat and Power company will receive \$875 in the bonds upon the surrender of the certificate and by the payment of \$100 in cash on or before May 31st." The United Gas Improvement company agrees to sell to the stockholders of the North Hudson company who avail themselves of the offer stock in the United Electric company to an amount of 25 per cent. at par of their holdings in the North Hudson company at \$30 a share, the par value of each share to be \$100.

PUBLICATIONS.

The Western Electric company, Chicago and New York, has issued its second fan-motor bulletin, 17 F, descriptive of desk and bracket fans.

The Western Electric company, in addition to its handsome 40-page fan-motor catalogue, is issuing a series of four-page bulletins, descriptive of the different styles of fans. Bulletin 16 F, on "W. E. Standard Ceiling Fans For Direct Current," has just been issued.

Dixon's "Teachers' Note Book," issued by the Joseph Dixon Crucible company of Jersey City, N. J., tells all about lead-pencils, their properties and the methods of manufacture. The pamphlet also contains interesting information of a miscellaneous character and blank pages for memoranda.

Locke's line material for high-potential circuits is of approved excellence and widely known. The porcelain and glass insulators, steel pins and other specialties bearing the name of Locke are handsomely illustrated and clearly described in a new catalogue which may be obtained by addressing Fred M. Locke, Victor, N. Y.

A handsome catalogue of electric ceiling and column fans is issued by the Backus Water Motor company of Newark, N. J. The fans described and illustrated are said to be of the highest grade, electrically and mechanically. A special feature is a two-speed switch furnished with fans when desired. The western agent of the company is the Chicago Motor and Fan company.

Lighting has no terrors, we are told, for users of Garton lightning arresters, which are made by the Garton-Daniels Electric company of Keokuk, Iowa, for use on any circuit, either direct or alternating current. A new catalogue, neatly printed with wide margins, tells all about these protective devices and gives pictures of them, with a list of users and testimonials.

Pamphlet No. 4, issued by the Electrical Bureau of the National Board of Fire Underwriters, 157 La Salle street, Chicago, gives the laws and ordinances adopted by various states and municipalities to regulate the installation and use of electrical apparatus. It has lately been revised, and the new edition is brought up to date. It is especially valuable to electrical inspectors, whether for municipalities or fire-insurance companies.

The 1899 fan-motor catalogue of the Western Electric company, Chicago, now out, is complete, with prices, and well illustrated. The pamphlet contains 40 large (10 3/4 by 8-inch) pages, besides the cover, which is of a deep red color. The large pages give opportunity for exceptionally large explanatory cuts, which are a feature of the catalogue. Desk, bracket, ceiling and column fans for direct and alternating-current circuits are described.

The Bates electric fans are shown in a small catalogue issued by D. L. Bates & Bro. of Dayton, Ohio. Especial attention is paid by this firm to ceiling fan motors for either direct or alternating current, which are, it is said, acknowledged to be superior to any others on the market. The fans are furnished with lamp attachments, if desired, making a very attractive electrolier. The lights revolve with the blades, and in winter the blades may be detached. Column, desk and bracket fans are also described.

A recent catalogue of real usefulness to all electrical men is the "Complete Catalogue for 1899 of Weston Standard Electrical Instruments," issued by Meysenburg & Badt of Chicago, the western agents for the Weston Electrical Instrument company of Newark, N. J. It is superfluous to praise the Weston instruments, and it is sufficient to say that the "complete catalogue" describes and illustrates all

types of portable and station instruments to indicate the value of the book. Instructions for placing the instruments in position and diagrams of connections are also given and will be appreciated by practical men.

Students of telegraphy may obtain J. H. Bunnell & Co.'s "Manual of Telegraphy," which is combined with the firm's telephone catalogue, by merely applying to the concern at 76 Cortlandt street, New York. No charge is made for the pamphlet, which consists of 112 pages, with many illustrations, and contains much valuable information. The instruction in telegraphy is clearly written and is practical and helpful. The catalogue portion of the book is useful to all users and dealers in telegraph and telephone supplies.

"Transformer Design and Operation," published by the General Electric company of Schenectady, N. Y., is a pamphlet from which the station manager can obtain much valuable information. Two recent papers on transformers in service—that of Mr. W. F. White before the Omaha meeting of the American Institute of Electrical Engineers and that of Professor Goldsborough at last year's convention of the National Electric Light association—are reprinted, and the "type H" transformers of the General Electric company are exploited. The advantages and economy of substituting modern large transformers, supplying groups of customers, for a number of small house-to-house transformers are pointed out.

Nash gas and gasoline engines are described in a new catalogue issued by the National Meter company of New York. Pictures show all the distinguishing features of the engine, and all needful information, tables of sizes and data of power and cost are given in the text. The Nash engine is believed to be especially well adapted as a prime mover for dynamos, and several direct-connected sets are illustrated. On the interesting subject of the direct connection of gas engines and dynamos the company says: "The principal difficulty met in producing a satisfactory direct-connected electric-lighting plant operated by a gas engine has been to secure the requisite close regulation in speed of both engine and dynamo. To explain how this has been accomplished, it may be said that we use, for all our larger engines, the Beau de Rochas system, commonly known as the four-stroke cycle, and govern by the principle of missed ignitions. * * * We may state that our method of direct connection secures a practically unvarying speed for the generator, and therefore produces a light so steady that the eye is unable to detect any flickering in the lamps, while the fluctuations of the voltmeter are almost imperceptible under changing loads. This regulation, so essential to a commercially successful electric-lighting system, is, we believe, unapproached by any other gas-engine combination, and it is due, in large measure, to the fact that the dynamo is not rigidly connected to the engine shaft, but is driven by our special centrifugal clutch coupling, by virtue of which any tendency to variable speed in the generator that would follow a like variation in the engine or the load is at once corrected so as to keep the generator speed constant."

TRADE NEWS.

H. J. Gorke, electrical supply dealer, has found it necessary to secure increased store capacity. His new address is 305 South Clinton street, Syracuse, N. Y.

To accommodate its eastern customers the Cutler-Hammer Manufacturing company of Chicago has opened a New York office at 136 Liberty street, where it will carry a large stock of rheostats. This office will be in charge of Mr. W. H. McGregor.

C. E. Corrigan, manager of the American Electric Vehicle company, Chicago, states that his company is daily booking orders for its vehicles. The business of the company is becoming greater each day and is by no means confined to the United States. Orders from Hawaii, Belgium, Hungary and several other foreign countries are now on hand.

Prof. R. C. Carpenter of Sibley College, Cornell University, is now engaged in making a series of exhaustive tests with Cling Surface compound for belts. A preliminary report, just made, shows most surprising results as to the increase of transmitting power of belts from the use of Cling Surface. A full report, with diagram of curves, will be issued soon.

Mr. Charles McLaughlin, the surviving member of the firm of J. H. Bunnell & Co., 76 Cortlandt street, New York, with his competent assistants in the various departments of the concern, is pushing the business with intelligence and zeal, and customers may rest assured that all orders placed with the firm will receive the same careful attention as heretofore. The concern manufactures, imports and deals in telegraph, telephone, railway and electric-lighting supplies, and Mr. McLaughlin has been the active manager of the business from its inception. The high standard of the firm's apparatus will be maintained under the same firm name, and no interruption of the satisfactory extension of the business is anticipated.

Every spring season the Garton-Daniels Electric company of Keokuk, Ia., is rushed with orders for

its lightning arresters, and, knowing what to expect each year, it endeavors during the winter months to prepare as large a stock as possible. This spring it had twice as large a stock on hand as ever before, but has just doubled its force in order to keep pace with the demand for these goods, and still finds that it is shipping faster than it is manufacturing. Additional force will be employed, however, and all orders will be shipped with the usual promptness, as the company thoroughly appreciates that when a man wants lightning arresters he wants them badly. This company's catalogue No. 22 seems to be in great demand, and a second edition may be required.

BUSINESS.

The Western Electric company, Chicago and New York, is especially prepared to fill all demands for sockets, switches and cut-outs.

The Electric Appliance company reports large sales of the P. & S. junction box, which is an all-

porcelain box for high-voltage service. The P. & S. box seems to meet all requirements and finds a ready sale wherever introduced. The Electric Appliance company carries a large stock of these goods.

Seymour Swarts, president of the Swarts Metal Refining company, Chicago, reports a large and flourishing business. One of the best-known concerns in the business, the company is adding to its large trade from day to day. Electric-light, street-railway and other electrical men who have scrap copper wire for sale will receive the highest market price from the Swarts company.

The Central Electric company, Chicago, is adding physical apparatus to its already complete electrical lines. The company is now sending out an attractive booklet entitled "A Barometer for Weather Conditions." Our present climatic changes are very hard to "guess," with prospects of further hardships; hence it is suggested that all electric-light and street-railway companies request a copy of this booklet, and be independent of weather conditions.

The electrical fraternity will be interested to learn that the Royal Electric company of Peoria, Ill., manufacturer of alternating-current generators, transformers and accessories, has opened a Chicago office in rooms 1201-2 Marquette building, which will be in charge of J. B. Wallace. This step was necessitated by the large and increasing demand for the well-known Royal apparatus, which has found such favor throughout the country. Mr. Wallace will have charge of the sales of the Royal apparatus in the states of Ohio, Indiana, Michigan, Wisconsin and Minnesota, and in Northern Illinois and Eastern Iowa. He will be assisted by Edward Barr. The Royal Electric company, under the able management of G. G. Luthy, has met with gratifying success in pushing its apparatus, the merits of which are becoming better known from day to day. Mr. Wallace has extended experience and a wide acquaintance in the electrical business, and of late years has devoted especial attention to alternating-current apparatus. He should be a valuable acquisition for the Royal company.

ILLUSTRATED ELECTRICAL PATENT RECORD.

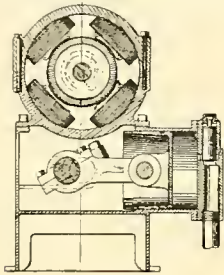
Issued March 21, 1899.

621,321. Electric Railway System. George L. Campbell, Dushore, Pa. Application filed May 5, 1898.

A trolley comprising a wheeled frame with wheels below the frame and pivotally connected therewith and brushes carried by the frame and engaging the pivoted wheels and a brush on the upper part of the frame is described.

621,324. Combined Pump and Motor. Niels A. Christensen, Milwaukee, Wis. Application filed December 30, 1896.

In a combined air pump and electric motor a motor base is attached to the frame and forms a cover for the oil chamber; an armature is supported upon the base and connected by gears with the crank shaft, and a gear case is attached to the frame and motor base and forming therewith an inclosure for the gears and a receptacle for holding oil, the frame gear case and motor base completely inclosing and protecting the driving connection of the pump and the crank shaft terminating within the gear case, whereby a stuffing box therewith is dispensed with.



NO. 621,324.

621,326. Automatic Telephone Switch. Charles S. Karoly, Aurora, Ill. Application filed November 9, 1897.

A telephone switch comprising a movable plate, a circuit of which the plate forms a part, a push finger having connection with the telephone wire and adapted for engagement with the plate to close a circuit, a receiver-supporting lever in the circuit, and a shoe pivotally connected to the lever for engaging with the plate and moving the plate out of engagement with the push finger.

621,352. Supply of Current to and Governing Arc Lamps. Frank M. Lewis, London, England. Application filed December 28, 1897.

An arc lamp comprising a transformer actuator and means controlled by the transformer actuator for regulating the arc are described.

621,361. Electric Burglar-alarm System. David W. McCaughey, Chicago, Ill. Application filed April 1, 1897.

Claim is made in an electric alarm system for the combination of a contact point, means for insulating the same, a metallic sleeve surrounding and inclosing the contact point and provided with lateral projections, a second metallic sleeve of thin die, and means for yieldingly holding such sleeves or thimbles apart, but arranged to yield when an attempt to drill or break the same is made and form electric contacts and short-circuits between the same.

621,412. Transfer Wattmeter Switch for Storage-battery Circuits. Charles Hewitt, Philadelphia, Pa. Application filed May 13, 1898.

There is a combination of a battery and its conductor, two recording devices, an electromagnet responding to the electrical condition of the conductor, and a polarized armature co-operating with the magnet and provided with means for connecting and disconnecting one or the other of the recording devices.

621,417. Electric Arc Lamp. Emil Hungerbühler, London, England. Application filed December 18, 1897.

A pair of circularly curved electrodes is employed, one of which is excited by a series coil and the other by a shunt coil, with a pair of circularly curved cores mounted on an axle which coincide with their respective centers of curvature, a pulley is mounted on the axle between the cores, and a pair of ropes passes over the pulley and serves to suspend the electrodes as well as to conduct current to them.

621,422. Trolley Catcher. Roswell I. Kroft, Avon Lake, O. Application filed April 14, 1898.

In trolley-catcher apparatus there is a combination with the trolley and adjusting rope and spring-actuated reel having a ratchet and locking pawl, of a trip spring actuated constantly to resist the pawl held in its engagement with the ratchet by the pressure of the reel spring, and a lever arranged to overcome the action of the trip spring and force the pawl into engagement with the ratchet.

621,449. Telephone System. Charles E. Egan, Burton L. Lawton and Ernest C. Wilcox, Meriden, Conn. Application filed February 25, 1898.

Metallic rails are insulated and supported in pairs upon the back of a switchboard, each rail being provided with metallic springs, each spring-jack with rods fitted to register with the springs, there being electrical connections with the rods on the one side and the rails on the other side.

621,471. Switch for Altering Speed and Direction of Revolution of Electric Motors, etc. William R. Edwards and Septimus F. Beevor, London, England. Application filed September 6, 1898.

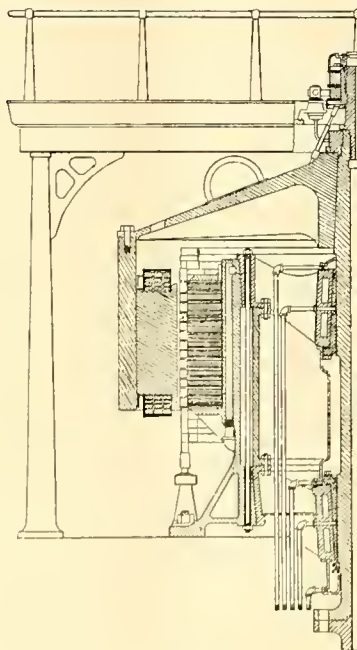
Claim is made for the combination in a switch for altering the speed and direction of revolution of electric motors, of a spindle turning in bearings in the frame, a switch arm carrying spring brushes insulated from another switch arm, concentric insulated contact pieces below the spring brushes on one side of the central line, concentric insulated contact pieces below the spring brushes but on the other side of the central line, insulated conductors connecting the different concentric contact pieces, and conducting wires and terminals with the poles of the two halves of the batteries with the coils of the field magnets and with the commutator brushes.

621,492. Electric Railway. William J. George, Johnstown, Pa. Application filed June 8, 1898.

A sectional conductor is composed of aligned sections, floating switch plates, housed directly within the contiguous ends of the sections, and normally in metallic contact therewith, and means, carried by the car, for causing the switch plates to move bodily out of contact with the conductor sections.

621,575. Electrical Warp Stop Motion for Looms. Frederic E. Kip, Montclair, N. J. Application filed June 17, 1898.

In an electrical warp stop-motion for looms the combination with the loom frame having the transverse rods fixed therein, the normally open operating electric circuit, having tubular terminals mounted loosely on the respective rods at their respective ends only, whereby distortion of the loom frame is prevented from bending the terminals, and the drops adapted to close the circuit at the terminals when a warp thread breaks.



NO. 621,717

621,594. Electrical Warp Stop Motion for Looms. William H. Baker, Central Falls, R. I., and Frederic E. Kip, Montclair, N. J. Application filed August 6, 1898.

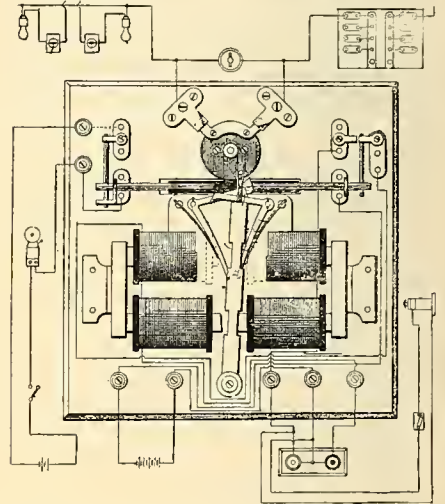
A fulcrum rod extends transversely of the warp, and a contact terminal also extends transversely of the warp, while a series of lever-like drops is interposed side by side on the rod, and a detached removable strip is supported on and carried by the longer arms of the drops.

621,604. Electric Heater. Edward E. Gold, New York, N. Y. Application filed January 8, 1898.

An electric heater comprising an open helix of wire having sufficient stiffness or resilience to retain its helical form, and a support therefor consisting solely of a rod or stiff wire extended within the helix, of materially smaller diameter than the interior thereof, so that the helix is interiorly open for free circulation of air within it, and supporting the convolutions of the helix by tangential contact therewith at single points only of their circumference.

621,631. Section Insulator. Edward J. Cook, Cleveland, O. Application filed March 5, 1898.

Claim one is for a metallic end piece for section insulators having a wire channel, a toothpick end and an arc-breaking flange.



NO. 621,739.

621,661. Insulator. Morton Harloe and Wilton S. Bloes, Peckville, Pa. Application filed February 1, 1899.

An insulator is described having a body portion with means for mounting it to swing, the body portion having located eccentrically thereon three studs separated by grooves, the end studs having overhanging outer ends and the middle stud having an overhanging inner end, whereby upon swinging the insulator the wire may be bent through the grooves and beneath the several overhanging ends of the studs.

621,716. Secondary-battery Plate. Alexander Schan-schieff and Albert E. Hodgson, Halifax, England. Application filed October 17, 1898.

A battery plate formed of two plates each having openings larger on one side than on the other, and V-shaped bars between the openings, the two plates being secured to each other with the pointed edges of the V-shaped bars together and active material filling the openings and V-shaped bars is described.

621,717. Dynamo-electric Machine. Coleman Sellers, Philadelphia, Pa. Application filed October 20, 1897. Renewed October 31, 1898.

In a dynamo having a vertical shaft it is proposed to utilize a frame or armature stand cylindrical in form having its upper and lower surfaces dressed parallel to a plane at right angles to its axis and its inner cylindrical surface bored conically top and bottom, spider frames carrying the shaft bearings having their exterior surfaces dressed conically to fit to the conical borings of the frame and concentric with the shaft, a coupling frame uniting the upper and lower spider frames, and means for drawing the spider frames to place within the frame.

621,733. Electric Belt. Thomas F. Wynne, Lindale, Texas. Application filed October 4, 1898.

The combination is described with cells and a cell-carrying plate of the cell pockets having slots and an outwardly bent tongue, and the wire passed through the slots and under the tongues, and having its ends secured to the plate.

621,739. Automatic Electric Switch. Robert Baumann, St. Louis, Mo. Application filed March 10, 1898.

A suitable base is provided, and pairs of electromagnets are arranged upon the base; an armature is pivoted at one end so as to swing between the cores of the magnets, to the sides of which armature opposite the ends of the cores are formed recesses, a pair of leaf-springs fixed to and extending forwardly from the free end of the armature, and means for making and breaking an electric circuit, which means is operated by the leaf-springs.

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No. 14

Electric Power Transmission in Mexico.

An electric power-transmission enterprise with valuable water-power privileges near Puebla, Mexico, is attracting considerable attention among those engaged in the development of the industrial capacities of the southern republic. The project is in the hands of an American company organized under the laws of Illinois and directed by Chicago capitalists. It is known as the Portezuelo Light and Power company, and is under the immediate direction of Mr. Chester D. Crandall of the Western Electric company, who is the president and chief promoter of the enterprise. The plans of the company provide for the building

distance of two kilometers more. The smaller tunnels vary in length from 100 to 600 feet, but the large tunnel, which is an imposing piece of masonry, is 2½ meters high and will admit a man walking erect from one end to the other.

The fall in the upper canal and tunnel is 20 centimeters per kilometer, and in the lower end of the canal 60 centimeters per kilometer. The sectional capacity of the canal is six cubic meters per lineal meter. The actual flow of water during the lowest stage in the dry season of the year is three cubic meters per second, or 3,000 liters. This large volume of water is conveyed through four 42-inch pipes

Chicago, who acted for the Portezuelo company, and is now superintending the installation of an equipment valued at \$275,000 gold. The installation will include four power generators of 1,200 horse power each. The line will comprise six copper wires. A three-phase system operating at 10,000 volts will be employed. The hydraulic installation will be supplied by the Pelton Water Wheel company of New York and San Francisco, and will comprise four water wheels of 1,200 hydraulic horse power each.

It is the intention of the company to furnish electric light and power. Puebla City uses 250 arc and 2,000 incandescent lamps in its city service, and the



Fig. 1. Dam to Divert Water from Atoyac River into the Canal.
Fig. 3. Section of Canal.

Fig. 2. Arch at Gate Controlling Flow of Water into Canal.
Fig. 4. View of Dam.

ELECTRIC POWER TRANSMISSION IN MEXICO.

of a power station in the Atlixco Valley, on the Atoyac River, 12 miles from the city of Puebla. At that point an immense water power has been developed by Sebastian de Mier, under a concession granted by the Department of Public Works of the Mexican government in 1880. The object of this improvement, upon which \$600,000 has already been expended, is to furnish hydraulic works for irrigating Mr. de Mier's immense estate. A system of canals and dams and locks has been built which overcomes the irregularity of the natural supply of the river.

The point of derivation of the water is in the mountains 12 miles south of Puebla, where the diverting dam, shown in Fig. 1, has been built. This dam leads the water from the headwater of the Atoyac into a canal and tunnel system, which continues in a south-westerly direction for 11 kilometers. The waters conducted from the river at the dam pass through a canal four kilometers in length, and then a tunnel nearly five kilometers through the heart of a mountain, and finally through 10 tunnels and a canal for a

from the entrance of the canal down the mountain side, a distance of 2,500 lineal feet, at an angle of 10 to 30 degrees, and a total perpendicular fall of 143 meters. This fall of 3,000 liters will produce 4,000 horse power, and the same water after passing this fall is conveyed four kilometers farther down the side of the mountain until a point is reached 200 feet above the floor of the valley, where the water supply at this point is capable of producing an additional 2,000 horse power, making a total at both falls of over 6,000 effective horse power to be utilized when the electric installation is completed in Puebla. This will then be the largest electrical installation in the republic of Mexico.

A section of the main canal is illustrated in Fig. 3, and the arch where the water enters the canal is shown in Fig. 2. This elaborate gate is a fair specimen of the work that has been done in this installation. The view of the dam, in Fig. 4, gives an idea of the volume of water that is controlled for this purpose.

Mr. de Mier leased the power to J. W. Ebert of

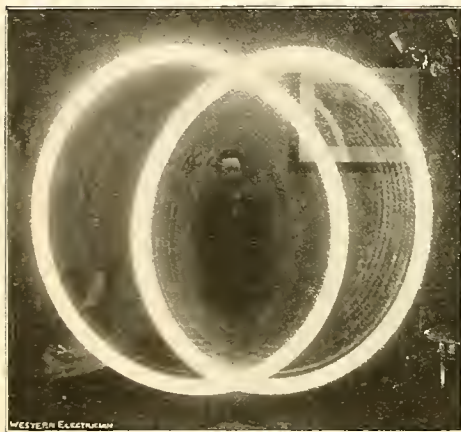
factories and mills in and around the town will take the remainder of the 2,000 horse power at first generated. Calculating coal at \$18 a ton and wood fuel at \$7 a cord, the price of power furnished by this company will be a reduction from one-half to two-thirds the price of steam power.

Puebla enjoys exceptional railroad advantages, being linked with the capital of the republic by two lines, and having a railroad to Vera Cruz and one to the southern city of Oaxaca. These facilities, combined with the cheap power, make it probable that many more factories will locate in Puebla. The city now is the most important manufacturing center in Mexico, and the list of factories which will be supplied with power by the new company includes cotton and woolen mills, shoe and hat factories and cornmeal mills. The company is now considering a proposition to enlarge its plant and secure additional power for transmission to other points. The city of Mexico is another excellent field for electric-power development.

Electrical Spectacular Effects.

The interesting photographs reproduced in Figs. 1, 2 and 3 of the accompanying illustrations show the graceful figures of light traced in the air by swinging electrically lighted Indian clubs in a dark room. The clubs are the property of Mr. George W. Patterson of Chicago, and he was swinging them at ordinary speed when the negatives were made. The time of exposure was from five to ten seconds, and the photographs were made by the light of the incandescent lamps studded on the clubs.

Mr. Patterson claims the distinction of having invented this spectacle, which is part of an electrical entertainment that he gives, and he has been perfecting his electrical club swinging and other "acts" for the last six years. The clubs are made in two parts, the split being lengthwise. A flexible cable of five wires leads into club handles through a rubber tube, the wiring being entirely concealed. Three series of eight, three and one candle power colored lamps are set in small, specially turned brass sockets the length of the club, so that the lamps stand out at right angles to its surface. This gives six series of different colors to the two clubs, with which most beautiful combinations of colors can be made, and rapidly changed, with appropriate music, by a man at a small switchboard behind the scenes. At the tip of each club there is a 32 candle power 50-volt lamp, which is usually run on 110 volts, the result being the brilliant light shown so prominently and distinctly in the large circles of light shown in the pictures outside the many smaller circles of the miniature lamps. These large lamps, either frosted or plain, are too dazzling for the naked eye when lighted and stationary, and are said to illuminate a large church or hall very well. Switches are placed



FIGS. 1, 2 AND 3. ELECTRICAL SPECTACULAR EFFECTS.

inside of the clubs, so that the series can be quickly cut in two for 52-volt circuits.

Another striking feature of the entertainment is the electrical storm, beginning with distant heat lightning, gradually increasing to the fiercest of chain or "zigzag" lightning, with corresponding gradation of thunder, the latter being produced in the usual manner by a "thundersheet" of iron. The heat lightning is simulated by well-distributed Geissler tubes, and the near-by lightning by the direct arcing of carbons in Mr. Patterson's hands. The arc is struck in a small box, and the light is thrown by a lens through a cardboard disk having lightning forms cut in it. The disk is revolved to any form desired and the light flashed out while the lens is pointed to the wall back of platform, on the ceiling or into the audience. The effect is very startling, especially as it is accompanied by the fiercest thunder, the sound of dashing rain and by Mr. Patterson's voice laughing and singing "The Lightning King" through a megaphone. "The Lightning King" is followed by the latter part of "Anchored," in which a perfect double rainbow gradually appears and is dissolved by a water rheostat, by sending the rays of a single-loop-filament incandescent lamp through a prism. The colors come out beautifully; when at their brightest the lamp is run greatly over voltage. By turning the lamp slightly, so that the filament is not in direct line with the prism, light from two points strikes the prism, producing two rainbows, as sometimes seen in the sky.

Mr. Patterson has been hampered for years in not being able to give his electrical effects except in halls or houses wired for electrical illumination, but, after much experiment, he has designed, built and tested a portable storage battery of high voltage and very light weight. The first one had a normal electromotive force of 58 volts, or 10 amperes at 40 volts, when necessary to draw on it so heavily. This weighed 63 pounds. But the style of battery best adapted for the purpose is the small one shown in Fig. 4 (which represents all of Mr. Patterson's "show" apparatus), weighing 35 pounds, with 32 volts normal and a capacity of 10 amperes at about 25 volts. This size may be readily carried by one person on a street car. As made now the small battery will charge at five amperes and throw off so little hydrogen that it can scarcely be detected, thus showing low internal resistance and high efficiency.

There are 17 1/4-pound lead plates, 7 by 10 inches, set on edge with a special separator, the whole bound together. A box is built closely around the plates, and the slight space between the lead and the box is filled with elastic insulating compound. The tops of plates are free to expand, but are well insulated. Each plate gives two volts, but the two end plates are half ones. One side of each plate is positive and the other side negative. This is a cheap battery to construct and weighs very much less than the ordinary battery of the same capacity. In small units it seems to be as efficient as any other battery; what it will do in large units has not been tested. The great trouble found in making this type of battery was to get a semi-elastic compound to seal up the bottom and sides that would stand the acid and allow the plates to expand without springing a leak, but the present compound seems to answer the purpose.

There are also a number of other electrical features, such as telephone with megaphone attachment, through which Mr. Patterson sings from a distant room, and a beautiful exhibition of rotating Geissler tubes of various sizes, forms and colors, operated by an electrolytic interrupter. The power of the electro-magnet is shown in lifting a boy from the platform. Other things shown are musical and fancy club and torch swinging. The music for the entertainment is furnished by good singers and performers through the "graphophone grand," the new instrument which reproduces music or the voice with almost the same volume and quality as the original. The horn of this graphophone is shown prominently on the table in Fig. 4.

Mr. Patterson is now planning to add wireless telegraphy (etherphone), a Nernst lamp, a vacuum lamp without filament, a large coil for X-ray ex-

hibitors and for the production of ozone, which is to be blown among the audience by an electric fan, and perhaps, with the aid of an atomizer and apple-blossom perfume, there can be produced the genuine air of a country orchard in the springtime after a heavy thunder-storm. He also hopes to secure liquid air to cool the churches or halls in hot weather.

Detroit Street-railway Ownership.

Under a new law the city of Detroit may purchase street-railway lines in that city. The City Council has appointed Governor Pingree, Elliott G. Stevenson and Carl E. Schmidt a commission to consider the matter. The commissioners have already conferred informally with Tom L. Johnson, the president of the local companies. Mr. Johnson was pleased, according to a correspondent, at the action of the council in selecting the commission. Governor Pingree, like his fellow-commissioners, protests his entire willingness to submit the proposed terms of purchase at the proper time to the council and the public. He frankly says his previous negotiations with Johnson resulted in his securing an option. This option, he asserted, was a short one, and he was sure the outcome would be three-cent fares with transfers; "and," added the governor, replying to charges of having rushed the act, "I'm willing everybody should know that I'm the 'old cuss' that helped push that bill through."

Proposed Russian Exposition.

The Department of State desires to make correction of an item which recently appeared in some papers, to the effect that the minister of finance of Russia had informed our embassy at St. Petersburg that American products intended for exposition purposes would be admitted free, upon the condition that a sum corresponding to the amount of the duties on the products be deposited as a guaranty; and that this sum would be returned in case the products should be exported within a certain time. The action of the Russian government was not taken in view of a general proposition that American manufactures should be admitted free for purposes of exposition, but was in view of a suggestion previously made that a special exposition in some designated Russian capital, for a limited time only, of American products and manufactures, might be or-

ganized by American exporters with the sanction of the United States government and the permission of the Russian government. The Russian minister's statement to the United States embassy at St. Petersburg had reference only to the treatment of goods sent to that exposition, should the proposed project be realized. It has no reference to any general admission of American goods for purposes of commercial display, and exporters should be cautioned not to attempt to send any goods or valuable samples to Russia on individual account under the impression that they will be bonded for re-exportation in the manner described.

New York Electrical Exhibition.

The management of the coming electrical show at Madison Square Garden, New York, for the month beginning May 8th is most enthusiastic over the prospects of the exhibition. From the following list of exhibitors booked to March 15th it would seem that the company has good reason to feel well satisfied:

American Engine company, Bound Brook, N. J.; American Electric Novelty and Manufacturing company, 255 Centre street, New York; American Vitrified Conduit company, 39 Cortlandt street, New York; American Electric Vehicle company, 1545 Michigan avenue, Chicago; American Miniature and Decorative Lamp company, 255 Centre street, New York; American Circular Loom company, Boston, Mass.; Adams-Bagnall Electric company, Cleveland, Ohio; American Microscope company, 377 Broadway, New York; American Pulley company, Philadelphia, Pa.; Ball & Wood company, 120 Liberty street, New York; Buffalo Forge company, Buffalo, N. Y.; Boston Electro-duct company, Boston, Mass.; Bullock Electric company, 220 Broadway, New York; Bossert Electric Construction company, Utica, N. Y.; Bryan-Marsh company, 136 Liberty street, New York; Clings-surface Manufacturing company, 146 Virginia street, Buffalo; Cincinnati Shaper company, Cincinnati, Ohio; Crocker-Wheeler Electric company,

39 Cortlandt street, New York; Camp company, H. B. Aultman, Ohio; Colliery Engineer company, Scranton, Pa.; Corey, R. B., 26 Cortlandt street, New York; Columbia Incandescent Lamp company, St. Louis, Mo.; Cutter Electrical and Manufacturing company, 1112 Sansom street, Philadelphia, Pa.; Dietz, Schumaker & Boye, Cincinnati, Ohio; Dixon, Jos., Crucible company, Jersey City, N. J.; Dale company, The Thames & Greenwich streets, New York; Emerson Electric Manufacturing company, St. Louis, Mo.; Estey & Saxe, 97 Fifth avenue, New York; Electrical Appliance company, Jersey City, N. J.; Electrical Engineer Institute of Correspondence Instruction, 120 Liberty street, New York; Forbes, W. D. & Co., Hoboken, N. J.; Fayerweather & Ladew, 159 East Houston street, New York; Friok, I. P., 551 Pearl street, New York; Granger, Francis, 26 Cortlandt street, New York; Griffing, A. A., Iron company, 66 Centre street, New York; Gold Car Heating company, Frankfort and Cliff streets, New York; General Incandescent Arc Light company, Thirty-third street and First avenue, New York; International Correspondence Schools, 14 East Seventh street, New York; Indiana Bicycle company, Indianapolis, Ind.; India-rubber and Gutta-percha Insulation company, Glenwood, N. Y.; Kaufman & Alexandre, 1153 Broadway, New York; Lamble, H. V., Rockaway, L. I.; Libbey Glass company, Toledo, Ohio; Machado & Roler, 203 Broadway, New York; McKay Engineering company, 106 East German street, Baltimore; National Gramophone company, 874 Broadway, New York; National Meter company, 118 Chambers street, New York; New York Electric Equipment company, Thirty-third street and First avenue, New York; Northern Engineering company, 39 Cortlandt street, New York; Niles Tool Works, Niles, Ohio; Northern Electrical company, Madison, Wis.; New York Telephone company, 18 Cortlandt street, New York; Orient Electrical company, Youngstown, Ohio; Prindle Pump company, 120 Liberty street, New York; Paragon Fan Motor company, Brooklyn, N. Y.; Pope Manufacturing company, motor carriage department, Hartford, Conn.; Pittsburg Reduction company, Pittsburg, Pa.; Rockwood Manufacturing company, Indianapolis, Ind.; Roebbling's, John A., Sons Co., 117 Liberty street, New York; Risley-Bird Manufacturing company, 91 Fifth avenue, New York; Riker Electric Motor company, 45 York street, Brooklyn, N. Y.; Standard Steam Specialty company, 83 Centre street, New York; Stirling company, The Chicago, Ill.; Safety Insulated Wire and Cable company, 229 West Twenty-eighth street, New York; Warren-Medbury company, Sandy Hill, N. Y.; Williams, J. P., 39 Cortlandt street, New York; White, S. S., Dental Manufacturing company, Chestnut and Twelfth streets, Philadelphia, Pa.; Wagner Electric Manufacturing company, St. Louis, Mo.; Willard & Frick, Rochester, N. Y.

General Manager Marcus Nathan is as "busy as a bee" getting all affairs in shape and he states that contracts have already been closed for space far in excess of those signed at a corresponding date in advance of the 1898 show.

All the exhibits of this year will be shown in the amphitheater, and the scope of the exhibition will include not only electricity, but also the kindred industries. The exhibit of automobiles will be larger than any ever held in this country, the section set aside for this purpose having been already oversubscribed for. Exhibitors of boilers, engines and steam specialties will undoubtedly be pleased with

the arrangement, which brings them up from the basement on to the main floor of the exhibition hall. The space allotted for these lines is almost entirely disposed of at this early date, so that exhibitors interested will do well to make speedy application. A special section will be set aside for patents and inventions, the idea being to enable inventors whose goods are not yet on the market to display them here to the thousands of interested persons, including a number of investors, at small cost.

It is desired that the electrical fraternity understand that in addition to the convention of the National Electric Light association there will be meetings of other engineering societies every day during the show. For the benefit of the industry all these meetings will be scheduled in advance and lists of participating members will be furnished to exhibitors. Special days will be arranged for the exporters and also for the people who will be interested in the development of Porto Rico and Cuba.

Falling Rock on Gorge Road at Niagara Falls.

Cruel fate seems to have determined to injure the Gorge road at Niagara. During the last winter its financial matters were so troublesome that it was forced to pass into the hands of a receiver, and now even the great rocks of the cliffs beneath which it runs appear determined to leave their resting place of centuries to pound it to pieces. Recently the Western Electrician presented two views, showing the fall of rock that had occurred along the line this spring, but on March 31st these conditions were outdone by a veritable avalanche of rock that came



FIG. 4. ELECTRICAL SPECTACULAR EFFECTS—MR. PATERSON AND HIS APPARATUS.

down from the cliff-top 200 feet above. So great was this fall of rock that the earth in the northern section of the city of Niagara Falls fairly trembled from the shock, which occurred about 5 a. m. When full daylight came it was seen that the avalanche had taken place on the south side and close to the Buttery elevator at the Whirlpool Rapids. There, on the tracks of the Gorge road, were piled many hundred thousand tons of rock, all of which had tumbled in one mass from the bank. Part of it had fallen upon the buildings at the base of the Buttery elevator, crushing them into kindling wood, and doing considerable damage. One of these buildings was entirely new, having replaced an old elevator shaft, wrecked by the wind a few weeks ago. About 30 or 40 feet of the foot of the new elevator shaft was broken off by the rock fall, and it was impossible to operate the cars. One mammoth limestone rock had fallen upon the tracks of the Gorge road, full in the center of the roadbed, crushing it down and smashing it out almost into the Whirlpool Rapids. This single rock weighed thousands of tons, and had it gone a few feet further it would have rolled into the rapids. But there is no doubt, despite the great mass of rock on the tracks, that much of the rock that fell with the avalanche went into the river.

An examination of the point from which the rock fell revealed that another great mass was ready to make the plunge into the gorge, and policemen were stationed to warn venturesome people from going near the spot. Later on the loose rock was blasted away and this source of danger removed. This immense chunk from the cliff falling on the roadbed makes still more difficult the work of getting the line in readiness for summer travel. It is a great many years since there has been such an avalanche of rock tumbled into the Niagara gorge, and the strange part of it all is that it was not at a point where such an event was expected, the general idea being that the bank there was quite solid.

E. S. Wilson has been appointed receiver for the Ironton Electric Light and Railway company of Ironton, O.

Annual Report of the Department of Electricity of Chicago.

There is much interesting information in the report of the Department of Electricity of the city of Chicago for the year 1898, just issued. This is the first annual report of the department, which was authorized on January 24, 1898, the electrical work of the city previous to that date having been under the direction of the Fire Department. The wisdom of uniting the various electrical activities of the city government in a separate department is shown by the work accomplished. The department has charge of the municipal street-lighting system, the isolated electric-lighting plants in city buildings, the fire-alarm telegraph, the police telephone service and the work of electrical inspection. Mr. Edward B. Ellicott, the city electrician, has labored with zeal, intelligence and honesty to extend and modernize the electrical plants of the city, and the report shows "a remarkable decrease in the cost of operating the lights and numerous improvements in the fire-alarm telegraph and police telephone systems." Moreover, in no instance was an appropriation exceeded. Credit for these results is shared with the efficient employes of the department by its head.

MUNICIPAL STREET ARC LIGHTING.

The annual city appropriation for 1898 included the net sum of \$140,152 available for extending the system of electric street lighting. Mr. Ellicott shows how this money has been expended. Work was commenced about April 15th. A complete station was equipped at Rice and Lincoln street, in a building formerly used as a repair shop, and the capacity of the station at Halsted street and Blue Island avenue and of that at Fourteenth street and Indiana avenue was materially increased. By December 31st there was in operation from these three stations 2,263 arc lamps of 2,000 nominal candle power each—an increase of 825 for the year. Mr. Ellicott's report ends with the calendar year of 1898, but it may be added that on April 1st of this year the total number of arc lamps operated from the Chicago municipal stations was 2,923.

It is noted that "the prices secured for machinery and supplies were the lowest ever granted for similar articles, and probably never will be duplicated." The contractors carried out the work to the entire satisfaction of the department and in accordance with the guarantees required.

The cost of construction for the new plant and extensions during 1898 is given as follows:

Equipment of Stations.

Steam and electric plant, with erection, at Rice and Lincoln streets.....	\$35,978.98
Additions at Halsted street.....	12,781.00
Additions at Fourteenth street.....	6,256.00

Total amount for equipping stations.....\$55,015.98

Line Equipment.

2,848 cedar poles.....	\$ 9,417.10
129,772 feet of underground cable.....	15,213.82
571,760 feet No. 6 line wire, cross-arms, pins and insulators.....	7,895.17
68,780 feet vitrified clay-pipe conduit.....	1,572.42
21,543 feet two-inch iron pipe.....	1,787.68
20 Columbia arc lamp posts.....	800.00
840 arc lamps and brackets.....	11,760.00
Labor erecting poles, wire, lamps and laying conduit.....	36,689.83

Total for line equipment.....\$85,136.02
Adding the totals together gives the amount of the appropriation, or.....\$140,152.00

The report states that much of the work was done during the most inclement weather, and was necessarily more expensive, "yet the average cost per arc lamp, for boilers, engines, dynamos, lamps and line work only reached the sum of \$166.85, and it is doubtful if ever such a low cost was reached by a municipality or private corporation for a corresponding amount of work and class of apparatus."

The next feature of the report is the one that will attract the most attention. It is on the cost of operation. In introducing his figures Mr. Ellicott makes this explanation: "Appreciating the fact that there is no credit in making misstatements of the cost of operating lights from municipal plants, and desiring to be in a position to prove the correctness of the actual cost to the city of Chicago, a most careful record of expenses has been kept for each month of the year. At the end of the year the added monthly costs were taken as a total cost and then checked with the total amount paid out for operating expenses, repairs and renewal of worn-out or obsolete apparatus." In the general table of costs as presented in the report the figures are given for four plants. The old Chicago avenue plant was operated part of the year, but afterward shut down, being superseded by the station at Rice and Lincoln streets. The three plants mentioned above are the ones now operated. The table of total costs for material and labor for the year in the four plants (average number of lamps, 1,710) is as follows:

Material—	
Coal.....	\$30,605.39
Carbons.....	6,216.90
Oil and waste.....	1,934.69
Globes.....	372.81
Engines.....	2,045.64
Boilers.....	3,493.57
Steam pipes.....	470.08
Dynamos.....	617.95
Lamps.....	4,278.34
Conduits and lamp posts.....	811.00
Underground circuits.....	586.65
Buildings.....	247.95
Rental of real estate.....	2,500.00
Sundry expense.....	3,346.09
Total material.....	\$57,436.85

Labor—	
Engineers and assistant engineers.....	\$ 371.66
Dynamo tenders.....	1,766.88
All-night lamp trimmers.....	2,844.23
All-night lamp trimmers.....	728.49
All-night lamp trimmers.....	15,372.84
Firemen.....	12,022.20
Stablemen.....	720.00
Machinists.....	135.00
Time and store keepers.....	779.99
All-night inspectors.....	429.89
Laborers.....	269.25
Total labor.....	\$42,967.43
Material as above.....	57,436.85
Labor as above.....	42,967.43
Total cost of plants.....	\$102,854.31
Cost of labor testing circuits.....	1,102.86
Cost of labor repairing circuits and conduits.....	5,977.59
Total cost.....	\$109,934.76
Total cost per lamp.....	62.52
Cost per lamp of improvements, average of 25 cents per lamp per month.....	2.98
Cost per lamp of office salaries, average of 25 cents per lamp per month.....	2.98
Grand total cost per lamp.....	\$68.48
Total number of lamp-hours.....	1,018,010
Average lamp-hours, each lamp.....	4,104
Average cost per lamp per hour.....	0.01666

It will be noted that the cost of operation is figured entirely on material and labor, with the excep-



FALLING ROCK ON GORGE ROAD AT NIAGARA FALLS.

tion of rental of real estate (which occurs in only one of the four plants) and office salaries. Other items which would be given in the report of a commercial company, such as taxes, insurance, water, interest on capital, etc., do not appear.

The remaining portion of the report relating to cost of operation is substantially as follows:

"In the above costs appear an item of lamp repairs. This item covers the rebuilding of 80 per cent. of the arc lamps used by the city previous to 1898. The lamps were sent to the manufacturers and made as good as new.

"On engine repairs it was found necessary to rebuild all of the valve stems and eccentric rods of two 600 horse power engines, put in two new pistons, re-babbit main bearings, and several minor repairs; rebuild one Ideal engine and put in two new wrist pins in other engines. These repairs make these engines as perfect as the day they left the shops, as far as operation and life are concerned.

"Extensive repairs were also made to four boilers. "About 75,000 feet of old underground cable was pulled out and new cable for 10,000 volts pressure installed in place.

"In doing this a great deal of cable was saved by rearranging the circuits. The old cable was sold and the difference in price charged to operating expenses.

"The cost per light per year for the different items is as follows:

Table with 2 columns: Item and Cost. Items include Coal, Carbons, Oil and waste, Lamp globes, Repairs to engines, Repairs to boilers, Repairs to steam pipes, Repairs to dynamos, Repairs to lamps, Repairs to conduits and lamp posts, Repairs to underground circuits, Repairs to buildings, Rental of real estate, Incidental expenses, Engineers and dynamo engineers, Dynamo tenders, Night inspectors, trimmers and labor, Lamp trimmers, Firemen, Stablemen, machinist, time and store keeper. Total: \$62.44

"By separating the above figures into two parts we find the cost per year of producing the necessary power for each arc lamp is as follows:

Table with 2 columns: Item and Cost. Items include Coal, Oil and waste, Repairs to engines, Repairs to boilers, Repairs to steam pipes, Engineers, Firemen, One-third of incidental expenses. Total: \$35.02

"This cost of \$35.02 for power alone is too high, and a great saving will be made in 1899, the plans for so doing having been completed the last of December. There will be a saving of at least \$10 per light per year.

"Owing to the rebuilding of so many lamps this year the cost for 1899 should be at least \$1 a lamp less than during 1898.

"The cost of repairing underground circuits has been excessive, for the reason that a great deal of the amount charged has been for rebuilding the circuits—a charge that will not appear this year.

"The most important change made during 1898 was the shutting down of the Chicago avenue station and moving the electrical machinery to Rice and Lincoln streets station, where more economical steam apparatus was installed and the cost of labor was practically no more than before the addition to the station. A pay-roll of about \$500 a month was saved in addition to the coal, amounting in all over \$800 a month.

"The Halsted street and Rice and Lincoln streets stations are modern electric-lighting stations, and have no superior in the United States for economical operation. The Fourteenth street and Indiana avenue station is poorly equipped with engines, and is not economical to operate when compared with the other stations. Plans are completed to change this station during the year of 1899 and place it on a par with the others.

"It has required the best part of two years to bring the plants to their present efficiency and system of operation. There are further opportunities to be taken advantage of.

"The station cost of maintaining an arc lamp for December in 1896, 1897 and 1898 was as follows:

Table with 2 columns: Year and Cost per lamp. Data for 1896, 1897, 1898.

"About the same ratio per month will apply, except during June, July and August, during which time it

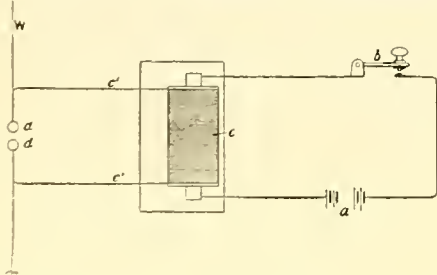


FIG. 1. WIRELESS TELEGRAPHY.

will be slightly less, on account of short hours the lights are operated."

FIRE-ALARM TELEGRAPH.

The number of fire-alarm boxes in service on December 31st was 1,296. The total number of alarms transmitted during the year was 6,423. One box was "pulled" 77 times. The total amount of wire in service in fire-alarm and police telephone systems is 3,524 miles. Not a single alarm of fire was lost during the year. Probably the most important change made in this bureau during the year was the substitution of storage batteries for a large number of gravity batteries. This change was made after conducting an exhaustive test to prove the advantages of using storage batteries. The cost of maintenance is greatly reduced, and the advantages of a practically uniform current and voltage are secured. The total number of primary batteries displaced was 2,144, costing for maintenance \$3,354.46 a year. The total number of accumulators installed is 782, costing for maintenance \$1,272.43. The annual saving in maintenance is \$2,292.03. The new motor-generator equipment, used as a relay for a part of the storage batteries, gives satisfactory service. A large amount of old iron line wire was replaced with hard-drawn cop-

per wire, and in a number of places overhead wires were replaced with underground cables.

POLICE TELEPHONE SYSTEM.

The total number of police signal boxes installed is 1,318. The old-style telephone transmitters have been replaced in many instances with modern long-distance transmitters, and the entire system will soon be changed. It is stated that, owing to the almost universal use of the grounded trolley system in Chicago, the old-style transmitter was almost inoperative—a condition that is corrected with the new style. This change was made without cost to the city, except for a small amount of labor.

ELECTRICAL INSPECTIONS.

The report shows a large increase in electrical work throughout the city, with but slight increase in the cost of maintaining the bureau of inspection, and few electrical fires. The cost for inspections has been greatly reduced during the year, and the charges are now made on a sliding scale, giving the advantage

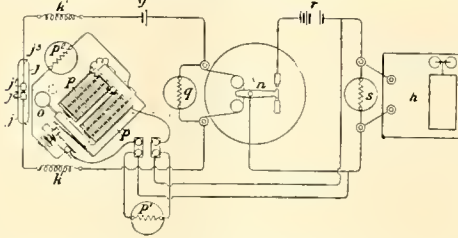


FIG. 2. WIRELESS TELEGRAPHY.

of cheaper inspection to large installations, where the expenses of making inspections are naturally less. The total receipts for electrical inspections in 1898 were \$15,223.97, and the expense of making them was \$12,525.11.

ELECTRICAL FIRES.

A table is given showing that there were 80 fires caused by electricity in Chicago during the year. The total loss was \$13,109.48—certainly a moderate amount. The causes in detail are thus enumerated:

- High-tension grounded by moisture, 18 fires; low-tension grounded by moisture, 8 (loss, \$396); pole broke, 1; concealed low-tension crossed, 5 (loss, \$5,655.92); high-tension crossed with telegraph, 1; high-tension grounded on cornices, roof and ceilings, 4; broken wire grounded, 1; outside switchbox, 4; short-circuit in elevator motor, 1; broken lamps set fire to varnish, 1; elevated railroad (South) troubles, 4; socket short-circuited, 1; (loss, \$253); crossed telegraph lines, 1; low-tension switch short-circuited, 3 (loss, \$5,500); low-tension wires short-circuited, 1 (loss, \$334); low-tension wires outside crossed, 1; low-tension wires crossed during repairs, 1 (loss, \$2,125.06); low-tension wires crossed in pipe shaft, 1; transformer wires left exposed—abandoned, 1; high-tension wires crossed, 2; low-tension poor connection, 2 (loss, \$3,795); waste basket on electric stove, 1; lightning, 1; cable failures, 8; high-tension insulation stripped, drawing in, 1; faulty transformers, 1 (loss, \$45); high-tension crossed with telephone line, 1; window trimmer crossed low-tension wires, 1; fuse block maintained an arc, 1; high-tension grounded by nails, rods and pipes, 3.

STATISTICS OF ELECTRIC LIGHTING.

The number of electric-lighting stations and lamps in Chicago is given as follows:

Table with 4 columns: Type of Plant, Number of Stations, Number of Arc Lamps Operated, Number of Incandescent Lamps Operated Equivalent of 16 Candle Power. Rows include Commercial companies, central stations, Isolated plants, City plants, street lighting, City plants (isolated), in cluding city hall and water works, and Total.

ELECTROLYSIS.

On this subject Mr. Ellicott says: "The question of damage to water pipes and other underground metals which are so situated that they may become conductors of current shunted into them by the electric street-railway circuits using the grounded return has caused a most careful investigation to be made in nearly all the large cities throughout the United States. This investigation in Chicago was commenced nearly two years ago, and the indications shown by the many tests made and a subsequent inspection of pipes demonstrated that the fears of actual damage were well grounded. Over 1,000 tests were made between the street-railway companies' rails and the water and gas pipes and such of the elevated roads as were using electricity as a motive power.

"In many places the voltage shown indicated an extremely dangerous condition existed, and requests were made on the different companies to immediately take the necessary measures to obviate any further damage to the metals not intended to form a part of their return circuit. The requests in some instances have been complied with, and the indications of trouble removed, while in others no attention was paid to the request, and the conditions have become more aggravated. Three six-inch water mains were weakened at points to such an extent that they burst and sections were removed and replaced with new pipe. Over 25 service pipes were destroyed, and when removed samples were kept to be used as evidence in suits which will be started by the corporation counsel for the purpose of recovering damages and compelling a reconstruction of the defective parts of the return circuits."

Wireless Telegraphy.

By G. MARCONI.

"Wireless telegraphy," or telegraphy through space without connecting wires, is a subject which has attracted considerable attention since the results of the first experiments I carried out in this country became known. It is not my intention this evening to give my views on or discuss the theory of the system, with which I have carried out so many experiments, and by means of which I have worked various installations, but I hope to put before you some exact information of what has been done by myself and my assistants during the last 12 months, and also some reliable data as to the means employed to obtain such results. Much has been published on the subject, I must say, with varying accuracy, and there can hardly be anyone here altogether ignorant of the general characteristics of the system. Before I go into this subject further I wish to state that any success I have met with in the practical application of wireless telegraphy has been, in a large measure, due to the efficient co-operation which has been rendered by my assistants. I think it will not be out of place if I give a brief description of the apparatus.

Transmitter.—When long distances are to be bridged over and it is not necessary that the signals should be sent in one definite direction, I employ as transmitter an arrangement, as shown in Fig. 1, in which two small spheres connected to the terminals of the secondary winding of an induction coil are connected, one to earth, and the other to a vertical conductor w, which I will call the aerial conductor. Should it be necessary to direct a beam of rays in one given direction I prefer to use an arrangement similar to a Righi oscillator, placed in the focal line of a suitable cylindrical parabolic reflector f, Fig. 5. The transmitter works as follows: When the key b is pressed, the current of the battery is allowed to actuate the spark coil c, which charges the spheres of the Righi oscillator or the vertical wire w, which discharges through the spark-gap. This discharge is an oscillating one, and the system of spheres and insulated conductor becomes a radiator of electric waves. It is easy to understand how, by pressing the key for long or short intervals, it is possible to emit a long or short succession of waves, which, when they influence the receiver, reproduce on it a long or short effect, according to their duration, in this way reproducing the Morse or other signals transmitted from the sending station.

Receiver.—One of the principal parts in my receiver is the sensitive tube or coherer or radio-conductor, which was discovered, I think I am right in saying, by Professor Calzecchi Onesti of Fermo, and was improved by Branly, and modified by Professor Lodge and others. The only form of coherer I have found to be trustworthy and reliable for long-distance work is one designed by myself, as shown in Fig. 2. It consists of a small glass tube, four centimeters long, into which two metal pole-pieces j' j" are tightly fitted. They are separated from each other by a small gap, which is partly filled with a mixture of nickel and silver filings. This coherer forms part of a circuit containing the local cell and a sensitive telegraph relay actuating another circuit, which circuit works a trembler p, or decoherer, and a recording instrument h. In its normal condition the resistance of the filings in the tube j is infinite, or, at least, very great, but when the filings are influenced by electric waves or surgings, cohesion instantly takes place,

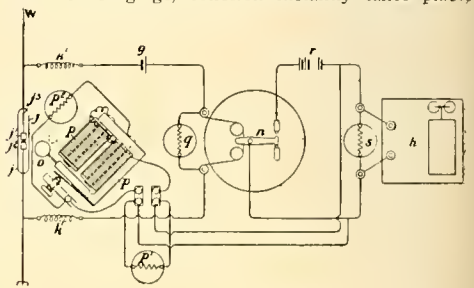


FIG. 3. WIRELESS TELEGRAPHY.

and the tube becomes a comparatively good conductor, its resistance falling to between 100 and 500 ohms. This allows the current from the local cell g to actuate the relay n. One end of the tube is connected to earth and the other to a vertical conductor similar to that of the transmitter, Fig. 1, or, if reflectors are used, a short strip of copper is connected to each end, Fig. 4. The length of these strips of copper must be carefully determined, as good results cannot be obtained unless they happen to be of the proper length, which will cause them to be in tune or sympathy with the transmitted oscillations. All the electromagnetic apparatus in the receiver is shunted by non-inductive resistances in such a manner that there may be no sparking at contacts and no sudden perturbations or jerks caused by the local battery current near the coherer. I find that the relay tapper and telegraphic instrument, if not properly shunted, produce disturbing effects, the result of which is to prevent the coherer from regaining its sensitive condition after the receipt of electrical oscillations. No such trouble is experienced when suitable shunts are used, and I attribute to their action, in very great

1. Read before the Institution of Electrical Engineers, London. 2. See Nuovo Cimento, series 3, vol. xvii., January-February, 1895, and January-February, 1896.

measure, the success which has been attained with this system. Small choking coils k'k' are introduced between the coherer and the relay. They compel the oscillating current due to the electric waves to traverse the coherer rather than waste its energy in the alternative path afforded by the relay. The oscillations induced on the strips k k or aerial conductor w, which acts as resonator, by the radiation from the oscillator affect the sensitive tube. This effect on the tube consists, as we have said, in a great increase of its conductivity, thus completing the circuit and allowing the current from the cell to actuate the relay. The relay in its turn causes a larger battery r to pass a current through the tapper or interrupter p, and also through the electro-magnets of the recording instrument h.

The tapper or trembler is so adjusted as to tap

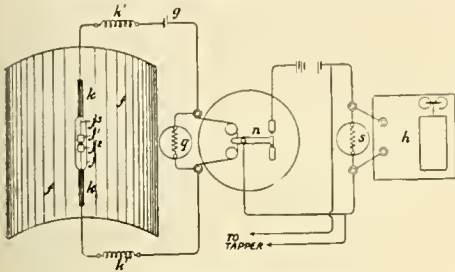


FIG. 4. WIRELESS TELEGRAPHY.

the tube and shake the filings in it. If, in the instant during which these various actions take place, the electrical oscillations had died out in the resonator, the shake or tap given to the tube by the hammer o would have restored it to its normal high-resistance condition, and the Morse instrument or recorder would have marked a dot on the tape; but if the oscillations continue at very brief intervals the acquired conductivity of the tube j is destroyed only for an instant by the tap of the trembler, and immediately re-established by the electrical surges; and, therefore, the relay tapper and telegraph instrument are again actuated, and so on, until the oscillations from the radiator have ceased. The practical result is that the receiver is actuated for a time equal to that during which the key is pressed at the transmitting station. For each signal, however short, the armatures of the relay and tapper perform some very rapid vibrations, dependent on each other. For it is the action of the relay which starts the tapper, but the tapper by its action interrupts the relay. The armature of the Morse recording instrument being rather heavy, and possessing a comparatively large inertia, cannot follow the very rapid vibrations of the tongue of the relay, but remains down all the time during which the rapidly intermittent action of the receiver lasts. In this way the armature of the inker gives a practically exact reproduction of the movements of the key at the transmitting end, dashes coming out as dashes and dots as dots.

Much has been said and written about coherers being very unreliable and untrustworthy in their action, but I must confess that this has not been in any way my experience. Provided a coherer is properly constructed and used on a suitable receiver, it is just as certain in its action as any other electrical apparatus, such as an electro-magnet or incandescent lamp. I have coherers which were made three years ago that are now quite as good, if not better, than they were at that time, and we have had tubes working for months in most important installations without ever giving trouble. At the installation my company has erected at the South Foreland lighthouse, which, as you probably know, is working to the East Goodwin lightship, the coherer was mounted on the receiver when we first started in December of last year, and has done its work in a most satisfactory manner ever since. I must call your attention to the object and function of the vertical wire w. It has been by means of this addition to the apparatus that we have been able to telegraph over distances which have been so far unattained, I think I am right in saying, by any other method of space telegraphy. The way I came to appreciate the great importance of the addition of the conductor w and earth connection E to the apparatus was as follows: (I take this data from a copy of a letter I wrote to Mr. Preece in November, 1896.) When carrying out some experiments in Italy in 1895 I was using an oscillator having one pole earthed and the other connected to an insulated capacity, the receiver also earthed and connected to a similar capacity. The capacities were in this case cubes of tinned iron of 30 centimeters side, and I found that when these were placed on the top of a pole two meters high, signals could be obtained at 30 meters from the transmitter. With the same cubes on poles four meters high, signals were obtained at 100 meters, and with the same cubes at a height of eight meters, other conditions being equal, Morse signals were easily obtained at 400 meters. With larger cubes of 100 centimeters side, fixed at a height of eight meters, reliable signals could be obtained at 2,400 meters all round, equal to about one mile and a half. These results seemed to point out that a system of transmitter and receiver designed according to the lines on Fig. 1, i. e., a radiator of the Hertzian type having one pole earthed and the other connected to a vertical, or almost vertical, conductor, or to a lofty capacity area, and a

resonator consisting of a suitable receiver having similarly one terminal connected to earth and the other to an insulated vertical conductor, constitute a system of transmitter and receiver capable of giving effects at far greater distances than the ordinary systems of Hertzian radiators and resonators. The results I have referred to also show that the distance at which signals could be obtained varied approximately with the square of the distance of the capacities from earth, or perhaps with the square of the length of the vertical conductors. This law has since been verified by a careful series of experiments and found correct, and has furnished us with a sure and safe means of calculating what length the vertical wire should be in order to obtain results at a given distance. It is well to know that the said law has never failed to give the expected results across clear space in any installation or experiment I have carried out, although it usually seems that the distance obtained is slightly in excess of what one might expect. I find that with parity of other conditions a vertical wire 20 feet long at the transmitter and receiver is sufficient for communicating one mile, 40 feet at each end for four miles, and 80 feet for 16 miles, and so on. An installation is now working over a distance of 18 miles with a vertical wire 80 feet high at each installation station.

Professor Ascoli has confirmed this, and demonstrated mathematically, using Neumann's formula, that the inductive action is proportional to the square of the length of one of the two conductors if the two are vertical and of equal length, and in simple inverse proportion of the distance between them. Therefore, the intensity of the induced oscillation does not diminish with the increase of distance if the length of the vertical conductors is increased in proportion with the square root of the distance; that is, if the height of the wire is double, the possible distance becomes quadrupled. Should it be necessary to rig up an installation at a distance of, say, 32 miles, such as is about the distance between Folkestone and Boulogne, it is easy to find that a vertical wire 114 feet long would be quite sufficient for that purpose.

Such laws are applicable only when apparatus properly constructed is employed. With apparatus in which some or several improved details are omitted I find it quite impossible to obtain any-

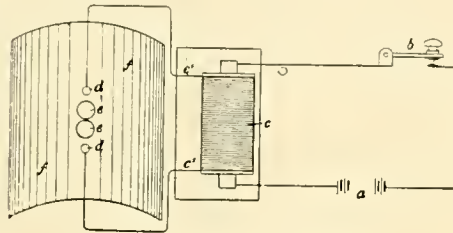


FIG. 5. WIRELESS TELEGRAPHY.

thing like the results above mentioned. If, say, the impedance coils k'k' are omitted, the distance (other conditions being equal) is reduced to almost half its original value. I must also call your attention to such cases as when obstacles like hills or mountains, or large metallic objects, happen to intervene between the places between which it is desired to establish communication. With all other forms of Hertzian transmitters and receivers with which I have experimented I find it to be quite impossible to obtain any results if a hill, mountain or large metallic object intervenes in any way between the two stations. I am not aware whether any satisfactory results have been obtained by others where such obstacles have intervened, but when the vertical-wire system is employed it becomes easy to telegraph between positions screened from each other by hills or by the curvature of the earth. In such cases it seems to be a marked advantage if the aerial conductor is thick or if a capacity area is placed at the top of it. I am rather doubtful as to the correct explanation that can be given to this effect. I think there can be very little doubt as to the complete opacity, to electric waves, of a hill three miles thick, or of, say, several miles of sea water. A solution of this difficulty might be given by attributing the results to the effect of the diffraction of such long waves as those radiated by a conductor 100 feet long, but in that case it is difficult to explain why other forms of Hertzian transmitters and receivers also giving long waves do not act when such obstacles intervene. A way out of the difficulty may be arrived at if we suppose that the electrical oscillations are transmitted to the earth by the earth wire E of the transmitter, and travel in all directions along the surface of the earth till they reach the earth wire of the receiving instrument, and by traveling up the said wire to the coherer thus bring about its action. This was the first explanation I came to during my early experiments. I, however, do not wish to say that I hold entirely to this view at present, although I have not yet found any other perfectly satisfactory explanation of the phenomena. It is well, also, to note that a horizontal wire, even if supported at a considerable height from earth, seems to be of little or no practical utility in increasing the range of signals. If, say, a vertical wire 30 feet long is employed at both stations, and to the top of this is added a horizontal length of 300 feet, as shown in Fig. 6, the distance

obtained is greater with the vertical wire without the horizontal length than it would be if both were employed. These results show that with this system it is not sufficient to use a horizontal radiating or collecting wire, as such a wire would be of no utility for long-distance signaling.

I believe that the exceedingly marked advance made by the adoption of the vertical conductor is due to the fact that the plane of polarization of the rays radiated is vertical, and that, therefore, they are not absorbed by the surface of the earth, which acts as a receiving conductor placed horizontally. As the maximum effect is obtainable when the conductors of the transmitter and receiver are parallel, this makes it necessary to have a vertical conductor connected to one pole of the coherer.

Before proceeding to describe the results obtained under various conditions by means of what we may call the vertical-wire system, I think it desirable to bring before you some observations and results I have obtained with a system of Hertzian-wave telegraphy, which was the first with which I worked, and in which parabolic reflectors are used to control the propagation and intensify the effects obtained when comparatively short electric waves are employed for signaling. As in ordinary optics, so also in the optics of electro-magnetic oscillations, it is possible, as has been shown by Hertz, to reflect the waves radiated from the oscillator in one definite direction only. This can be done, as you know, by using convenient reflectors, similar to those used for projectors, but preferably, for economical reasons, made of copper or zinc, instead of silver amalgam or silver. Except when very small radiators of the Righi or Lebedew type are employed, it is desirable to use cylindrical parabolic reflectors, and it is with reflectors such as I here exhibit that the trials to which I am alluding have been carried out. The advantages obtainable by their use are obvious.

In any other system intended for the transmission of telegraphic signals by means of electric waves through space, the waves have been allowed to radiate in all directions and would affect all suitable receivers within a certain radius, which, of course, is dependent on the power of the radiator or transmitter and on the sensitiveness of the resonator or receiver. It is, however, possible, by means of syntonizing arrangements, to prevent, to a certain extent, messages affecting instruments or receivers for which they are not intended, and therefore to select any receiver by altering the wave length of the transmitter. By means of reflectors it is possible to project the waves in one almost parallel beam which will not affect any receiver placed out of its line of propagation, whether the said receiver is or is not in tune or sympathy with the oscillation transmitted. This would enable several forts, or hilltops, or islands, to communicate with each other without any fear of the enemy tapping or interfering with the signals, for if the forts are on small heights the beam of rays would pass above the positions which might be occupied by the enemy. An illustration of the possibility of directing these waves can be shown by the action of the receiver, which in this case rings a bell only when the radiator in the reflector is directed toward it. These results are much more marked in an open space than in a lecture theater, as the walls, gilt hangings, etc., tend to reflect the rays in all directions and may alter the results.

In experiments carried over a distance of 1 1/4 miles I noticed that only a very small movement of the transmitting reflector was sufficient to stop the signals at the receiving end, which could be only obtained within a latitude of 50 feet to the right or left of what was believed to be the center of the beam of reflected radiations. There exists a most important case to which the reflector system is applicable, namely, to enable ships to be warned by lighthouses, light-vessels or other ships, not only of their proximity to danger, but also of the direction

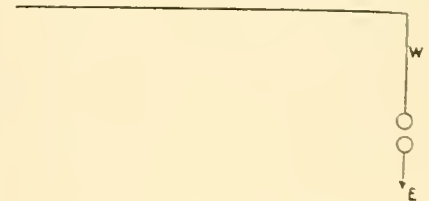


FIG. 6. WIRELESS TELEGRAPHY.

from which the warning comes. If we imagine that A is a lighthouse provided with a transmitter of electric waves, constantly giving a series of intermittent impulses or flashes, and B a ship provided with a receiving apparatus placed in the focal line of a reflector, it is plain that when the receiver is within range of the oscillator the bell will be rung only when the reflector is directed toward the transmitter, and will not ring when the reflector is not directed toward it. If the reflector is caused to revolve by clockwork or by hand, it will therefore give warning only when occupying a certain sector of the circle in which it revolves. It is therefore easy for a ship in a fog to make out the exact direction of point A, whereby, by the conventional number of taps or rings, she will be able to discern either a dangerous point to be avoided or the port or harbor for which she is endeavoring to steer. I have not up to the present

1. See *Elettricista*, August number, 1897. (Rowe.)



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DEPARTMENTS.

Table listing departmental contents with page numbers, including Correspondence, Electric Lighting, Electric Railways, etc.

of Marconi and his associates. Consul-general Gowdy writes from Paris that he has had an interview with E. Ducretet, the inventor and constructor of electrical apparatus, whose experiments have been described in these columns, and who asserts that messages could then (February) be perfectly transmitted a distance of about 13 miles through space without wire. The messages were dispatched and received between masts 30 meters high at the extreme ends of the distance. One of the principal obstacles encountered was the difficulty of securing automatic registration of the message, but this has been overcome, it was reported, by an instrument of Mr. Ducretet.

The source of atmospheric electricity has proved an attractive subject for investigators, and many interesting experiments have been conducted by students engaged in researches along this line. The work of H. Pellat, described in Comptes Rendus, and summarized by d'Albe in the London Electrician, is the most valuable contribution to the literature of the subject of late. The evaporation of the moisture of the earth's surface has for over a century been considered to account for the electric charge of the atmosphere, but, strange to say, it has been found almost impossible to prove that even a highly charged body of water, in evaporating, loses any of that charge with the vapor that rises from its surface. Lecher, indeed, proved such a loss with a potential of 25,000 volts, but then, as he says himself, the liquid was practically "pulverized," and was at any rate widely removed from ordinary conditions, such as exist at the earth's surface. H. Pellat has now succeeded, however in demonstrating a loss of 40 to 60 per cent. of the original charge in an hour's evaporation from a very shallow dish connected with a quadrant electrometer, and negatively charged by a battery giving 116 volts. Applying this observation to the negative charge of the earth, it appears that there must be a loss of that charge, and a gain of negative electrification by the air, during the first warm hours of the day, and the reverse process must set in after sunset. This is actually the case in all published observations, but these observations also show a minimum at 4 a. m. and a maximum at 8 p. m. Neither of these is yet accounted for, and they are both probably due to some influence as yet unknown. The impetus that has been given these investigations by Pellat's disclosures should stimulate interest in the subject, and it may result in still further valuable discoveries.

Mr. Armstrong's communication on the Brundage telephone bill, now before the Illinois Legislature, explains the action of the proposer of the measure and the attitude of the Bell interests toward legislation that is aimed at regulating the telephone business. It is not strange, however, that the public failed to appreciate the work that Mr. Brundage and his associates have done, inasmuch as the details presented by Mr. Armstrong had not been published, and no intimation of the plans and motives of the promoters of the movement had been given. On the question of compensation, too, Mr. Brundage and Mr. Armstrong seem to agree with the Western Electrician, and if they can bring their associates to a realization of the importance of returning to the original plans, which provided for fair rentals, they will perform a valuable service to the people of Chicago. Otherwise it would be far preferable that the bill be killed, as it will merely insure the Chicago Telephone company uninterrupted enjoyment of its present monopoly in this city. Capital will not invest in an independent company in the face of such a measure, and competition, which has been demonstrated to be the only real solution of the telephone problem, will therefore become impracticable.

Much stress is laid by the framer of the bill and its supporters upon the provision for interchanging service, but as this proposition involves the principle of common carriers, which is far from being established and recognized as applying to the telephone business, it cannot be assumed to affect the present relations of the Chicago Telephone company and the independent interests. It seems injudicious to burden a bill with provisions that invite litigation when the disputed points could be treated in an entirely independent measure. In the present situation, it would seem as if there was really nothing to be gained by the insertion of this matter, for if the law of common carriers applies to telephone companies

the fact must be established in any event by recourse to the courts, and the solution of the problem will not be hastened by the enactment of such a bill as the proposed measure. If, on the other hand, the courts should not accept the view advocated by Mr. Brundage and his associates, the law could be successfully attacked by the Bell interests on this point and thus delay the enforcement of other features that might be equally desirable.

The tendency to attack everything pertaining to the Bell system cannot be encouraged by the independent interests without danger to their own investments, and it is, therefore, well to consider problems of this nature in a conservative spirit and to do ample justice to all interests affected.

So much has been written about the operations of the American navy during the late war with Spain that the subject may be considered pretty thoroughly exhausted; but the reflections of those upon whom rested the responsibility for the successful termination of the struggle still possess great value, and as a matter of record their views upon the practicability of the innovations that were made may determine others in accepting or rejecting them. The experience of the American fleet under Admiral Sampson before Santiago was exceptional in that so much dependence was placed upon the searchlights to maintain the blockade. Within a week of his arrival at Santiago the American commander had thoroughly established this service, and then he felt that should Cervera attempt to leave the harbor the American sentries would have ample warning. In his interesting article in the Century for April, Admiral Sampson says:

Every night when the ship came up to her position and turned the light on, and I saw the harbor illuminated, I felt entirely secure. I looked at it many times during the night, always with the same feeling; and there it was night after night, with no variation. After we arrived we had the friendly aid of a brilliant moon, and as the moon waned we became very anxious; but after we had the searchlight we reviled the moon, because really we could not see as well with the moon as without it.

It is a matter of considerable interest that the Spanish squadron had only one searchlight, and that that had never been prepared for service.

Concerning the cable-cutting expeditions under his direction, Admiral Sampson explains the presence of so many cables and the absence of land lines in Cuba:

A curious cable system had grown up in Cuba, owing to the insecurity of the land lines. The Spaniards had learned from experience that only a submarine telegraph was secure against destruction by the Cubans. The poor insurgents had not the means of reaching the submarine cables, for the Spaniards occupied the towns and cities where the ends of the cables were landed; but the land lines on the south side were always at their mercy.

From Batabano on the west to Guantanamo on the east the towns were connected by submarine cables, and in some cases more than one cable was employed. To destroy all connection with the outside world was difficult. There were four cables from Santiago de Cuba to Jamaica, and one from Guantanamo to Santo Domingo; then there was the Key West cable to Havana, over which frequent, if not constant, communication was held during the whole war.

The government found itself without means of cutting this network of cables, and the Western Union Telegraph company, which had consented to the proposed cutting of the Havana-Key West line, furnished the grapneling apparatus required for the work in other parts of the island. Concerning the conditions that the American forces encountered, Admiral Sampson says:

As the water off the ports where the telegraph cables were to be destroyed was very deep, varying from a few hundred fathoms to several thousand, it was necessary that the grapneling outfit should be strong enough to lift a thousand fathoms of cable, or, if working in shoaler water, the cutting ship must work close under the shore and be exposed to fire. As all the cables are on the south side of the island, where we were not at the time prepared to blockade or to defend the grapneling ship, it was necessary to send a sufficient force to fight wherever it might be necessary. For this reason Captain Taylor of the Indiana was put in charge of the duty, with a considerable force.

In spite of these difficulties the Americans succeeded in cutting half a dozen important cables, and a few local lines, like that connecting Cienfuegos and Manzanillo, and while this did not bring about the original purpose to isolate the island from the outside world, it had the effect of crippling the service and was considered a valuable accomplishment.

The most comprehensive, complete and orderly narrative of recent developments in the field of "wireless telegraphy" that has yet been published is the paper before the Institution of Electrical Engineers at London, which is presented elsewhere in this issue. Marconi relates the nature and extent of his experimental work and the results obtained, and while much that is contained in the paper has been published in fragmentary form, it has never before been arranged in an orderly manner, so as to enable the student to make a critical examination of the work and clearly ascertain the relative importance of the discoveries there recorded as well as the bearing of each upon the art and its importance in advancing the investigation to a successful termination. The interest manifested in this work has been stimulated by the experiments that have been successfully conducted since that time in transmitting messages between France and England. The English electrical journals say that the enthusiasm displayed was greater than any former demonstration in the history of the society, even surpassing that which greeted Nikola Tesla's exhibition of high-frequency phenomena at the Royal Institution. Interest in this subject is not confined to the work

Wireless Telegraphy.

[Continued from page 199.]

attempted to signal any greater distance than about two miles with reflectors, but I am of opinion that across clear space it will be quite possible to obtain satisfactory results at far greater distances, especially if the reflectors are accurately made any larger than those I have used. By means of the same apparatus exhibited here I have succeeded in signaling over a distance of $2\frac{1}{2}$ miles without, of course, the use of any real "base" lines, which were supposed to be essential for any distance greater than a few feet. It was by means of reflectors I obtained the results over $1\frac{3}{4}$ miles, mentioned by Mr. Preece at the British Association meeting of 1896. I have, however, dedicated more time to the other system, i. e., the vertical-wire system.

A station at Alum Bay, Isle of Wight, and another at Bournemouth, the distance between them being $14\frac{1}{2}$ miles, were erected at the beginning of last year, in order to test the practicability of the system under all conditions of weather, and also to afford an opportunity of proving that "wireless telegraphy" was not a myth but a working reality. I believe some details of the special conditions of these stations would be of interest. The installation at Alum Bay is in the Needles Hotel, and the Bournemouth station (which has lately been transferred to the Haven Hotel, Poole, thereby increasing the distance to 18 miles) was at Madeira House, South Cliff. At each station a pole 120 feet high was used, which supported the aerial conductor, usually a stranded conductor of 7-20 copper wire insulated with rubber and tape. A 10-inch induction coil is used at each station, worked by a battery of 100 Obach cells, "M" size, the current taken by the coil being at 14 volts from six to nine amperes. The spark discharge takes place between two small spheres about one inch in diameter, this form of transmitter having been found more simple and more effective than the Righi oscillator I had previously used. The length of spark is adjusted to about one centimeter; this, being a much shorter spark than the coil can give, allows a good margin over any irregularity that might be caused by the break. No care is ever taken to polish the spheres, as the place where the spark occurs, as the results seem decidedly better with dull spheres than with polished ones. The first tests were made between the Isle of Wight and a steamer, the height of the mast on the boat being about 60 feet. Readable signals were obtained up to a distance of 18 miles from Alum Bay. During the course of these experiments I had the pleasure of the company and assistance of Captain Kennedy, R. E., who was good enough to draw a map showing the course of the steamer. It has apparently been thought that weather or varying conditions of atmospheric electricity may interfere with or stop the signals transmitted by this system, but experience of over 14 months of continual everyday work has brought me to the conclusion that there is no kind of weather which can stop or seriously interfere with the working of such an installation. We have given demonstrations to several eminent scientists, who came down and wanted a show, often when we did not expect them, but on no occasion have they found any difficulty in the work of transmitting and receiving messages between the two stations.

In September of last year, in consequence of the expiration of our lease at Madeira House, Bournemouth, we transferred that station, as I have said, to the Haven Hotel, Poole, thereby increasing the distance to 18 miles. Experiments and tests are carried out daily between the two stations, the improvement in apparatus having allowed us to reduce the height to 80 feet at each end. An average of fully 1,600 words is daily transmitted through the ether each way. In the spring of last year Lord Kelvin inspected our station at Alum Bay, and he was kind enough to express himself as highly pleased with what he saw. He sent several telegrams to his friends, including Mr. Preece and Sir George Stokes, and insisted on paying one shilling royalty on each message, wishing in this way to show his appreciation of what was done, and to illustrate its fitness at that time for commercial use. We are now working at experiments directed toward still further reducing the height necessary for a given distance, and also a good deal on syntonic systems. In May of last year Lloyds desired to have an illustration of the possibility of signaling between Ballycastle and Rathlin Island, in the north of Ireland. My assistants, Mr. Kemp and the late Mr. Glanville, installed the instruments at Ballycastle and at Rathlin Island. The distance between the two positions is $7\frac{1}{2}$ miles, of which about four are overland and the remainder across the sea, a high cliff also intervening between the two positions. At Ballycastle a pole 70 feet high was used to support the wire, and at Rathlin a vertical conductor was supported by the lighthouse, 80 feet high. Signaling was found quite possible between the two points, but it was thought desirable to bring the height of the pole at Ballycastle to 100 feet, as the proximity of the lighthouse to the wire at Rathlin seemed to diminish the effectiveness of that station. At Rathlin we found that the lighthouse-keepers were not long in learning how to work the instruments, and, after the sad accident which happened to poor Mr. Glanville, that installation was worked by them alone, there being no expert on the island at the time. Following this, in July, we were requested by a Dublin paper, the Daily Express, to report from the high seas the results and incidents

of the Kingstown regatta. In order to do this we erected a land station, by the kind permission of the harbor-master at Kingstown, in his grounds, where a pole 110 feet high was placed. A steamer, the Flying Huntress, was chartered to follow the racing yachts, the instruments being placed in the cabin. The height of the vertical wire was fixed by the mast was 75 feet. A telephone was annexed from our land station at Kingstown to the Express office in Dublin, and as the messages came from the ship they were telephoned to Dublin, and published in succeeding editions of the evening papers. The relative positions of the various yachts were thus wirelessly signaled while the races were in progress, sometimes over a distance of 10 miles, and were published long before the yachts had returned to harbor. During the several days the system was in use between the tug and the land station over 700 messages were sent and received, none requiring to be repeated. On trying longer distances it was found that with a height of 80 feet on the ship and the same height as already stated on land, it was possible to communicate up to a distance of 25 miles, and it is worthy of note in this case that the curvature of the earth intervened very considerably at such a distance between the two positions. On one occasion, on a regatta day, I had the pleasure of the company of Professor G. F. Fitzgerald of Trinity College, Dublin, on the ship, who, as would be expected, took a very great interest in the proceedings.

Immediately after finishing at Kingstown I had the honor of being asked to install wireless-telegraph communication between the royal yacht Osborne and Osborne House, Isle of Wight, in order that her majesty might communicate with H. R. H. the Prince of Wales, from Osborne House to the royal yacht in Cowes Bay and during the trips his royal highness frequently took. The working of this installation was a very pleasant experience for me, and it afforded, also, an opportunity of more thoroughly studying the effect of intervening hills. In this installation induction coils capable of giving a 10-inch spark were used at both stations. The height of the pole supporting the vertical conductor was 100 feet at Osborne House. On the royal yacht Osborne the top of our conductor was suspended to the main mast at a height of 83 feet from the deck, the conductor being very near one of the funnels, and in the proximity of a great number of wire stays. The vertical conductor consisted of a 7-20 stranded wire at each station. The royal yacht was moored in Cowes Bay at a distance of $1\frac{3}{4}$ miles from Osborne House, the two positions not being in sight of each other, the hills behind East Cowes intervening. This circumstance would have rendered direct signaling between the two positions impossible by means of any flag, semaphore or heliograph system. Constant and uninterrupted communication was maintained between the royal yacht and Osborne House during the 16 days the system was in use, no hitch whatever occurring. One hundred and fifty messages were sent, being chiefly private communications between the queen and the prince. Many of these messages contained over 150 words, and the average speed of transmission was about 15 words per minute. By kind permission of the Prince of Wales I will now read to you some of the telegrams which passed between the royal yacht and Osborne House:

August 4th, from Dr. Fripp to Sir James Reid:
H. R. H. the Prince of Wales has passed another excellent night and is in very good spirits and health. The knee is most satisfactory.

August 5th, from Dr. Fripp to Sir James Reid:
H. R. H. the Prince of Wales has passed another excellent night, and the knees in good condition.

The following telegram was sent during a cruise, and while the royal yacht was under way, as you will see from the context:

August 10th, from H. R. H. the Prince of Wales to Duke of Connaught:
Will be very pleased to see you on board any time this afternoon when the Osborne returns.

This telegram was sent when the yacht was off Bembridge, at a distance of about seven or eight miles from Osborne. On August 12th the Osborne steamed to the Needles, and communication was kept up with Osborne House until off Newton Bay, a distance of seven miles, the two positions being completely screened from each other (even to the tops of the masts) by the hills lying between. At the same position we found it quite possible to speak with our station at Alum Bay, although Headon Hill. Golden Hill and over five miles of land lay directly between. The positions were $8\frac{1}{2}$ miles apart. Headon Hill was 45 feet higher than the top of our conductor at Alum Bay station and 314 feet higher than the vertical wire on the Osborne. The yacht on the same trip proceeded till about three miles past the Needles, communication having been maintained during the whole trip. Another day, when I did not happen to be on board, the yacht went on a cruise round Bembridge and Sandown, communication being maintained with Osborne House, although more than eight miles of land lay between the two positions. The Prince of Wales and other members of the royal family, especially the Duke of York, made much use of the system, and expressed themselves as highly satisfied with its practicability. I consider these results rather interesting, as doubts have been expressed by some as to whether it would be possible by this system to telegraph over long stretches of land. Results across hills were also obtained near Spezia by officers of the Italian navy, using my system.

In December of last year my company thought it desirable to demonstrate that the system was quite

practical and available for enabling telegraphic communication to be established and maintained between lightships and the shore. This, as you are probably aware, is a matter of much importance, as all other systems tried so far have failed, and the cables, of which some three or four ships are sometimes connected, are exceedingly expensive, and require special moorings and fittings, which are troublesome to maintain and liable to break in a storm.

The officials of Trinity House offered us the opportunity of demonstrating to them the utility of the system between the South Foreland lighthouse and one of the following light-vessels, viz., the Gull, the South Goodwin and the East Goodwin. We naturally chose the one furthest away—the East Goodwin—which is just 12 miles from the South Foreland lighthouse. The apparatus was taken on board in an open boat and rigged up in one afternoon. The installation started working from the very first without the slightest difficulty. The system has continued to work admirably through all the storms, which during this year have been remarkable for their continuance and severity. On one occasion, during a big gale in January, a very heavy sea struck the ship, carrying part of her bulwarks away. The report of this mishap was promptly telegraphed to the superintendent of Trinity House, with all details of the damage sustained. The height of the wire on board the ship is 80 feet, the mast being for 60 feet of its length of iron and the remainder of wood. The aerial wire is let down among a great number of metal stays and chains, which do not appear to have any detrimental effect on the strength of the signals. The instruments are placed in the aft-cabin, and the aerial wire comes through the framework of a skylight, from which it is insulated by means of a rubber pipe. As usual, a 10-inch coil is used, worked by a battery of dry cells, the current taken being about six to eight amperes at 14 volts. Various members of the crew learned in two days how to send and receive, and, in fact, how to run the station; and, owing to the assistant on board not being as good a sailor as the instruments have proved to be, nearly all the messages during very bad weather are sent and received by these men, who, previous to our visit to the ship, had probably scarcely heard of wireless telegraphy, and were certainly unacquainted with even the rudiments of electricity. It is remarkable that wireless telegraphy, which had been considered by some as rather uncertain, or that might work one day and not the next, has proven in this case to be more reliable, even under such unfavorable conditions, than the ordinary land wires, very many of which were broken down in the storms of last month. The instruments at the South Foreland lighthouse are similar to those used on the ship, but as we contemplate making some long-distance tests from the South Foreland to the coast of France, the height of the pole is much greater than would be necessary for the lightship installation. We found that 80 feet of height is quite sufficient for speaking to the ship, but I am of opinion that the height available on the ship and on shore would be ample even if the distance to which messages had to be sent were more than double what it is at present. Service messages are constantly passing between the ship and the lighthouse, and the officials of Trinity House have been good enough to give expression of their entire satisfaction with the result of this installation. The men on board send numerous messages almost daily on their own private affairs; and this naturally tends to make their isolated life less irksome.

My company has been anxious for some time to establish wireless communication between England and France, across the channel, in order that our French neighbors might also have an opportunity of testing for themselves the practicability of the system, but the promised official consent of the French government has only been received this evening. Otherwise this communication would have been established long ago. The positions for the stations chosen were situated at Folkestone and Boulogne, the distance between them being 32 miles. I prefer these positions to Calais and Dover, as the latter are only separated by a distance of about 20 miles, which is only slightly more than we are doing every day at Poole and Alum Bay, and as we find that distance so easy, we would naturally prefer further tests to be made at much greater distances. We did ask for permission to erect a station at Cherbourg, the corresponding station to be at the Isle of Wight, but the French authorities stated that they would prefer us to have our station in that country in some other position on the north coast.

My system has been in use in the Italian navy for more than a year, but I am not at liberty to give many details of what is done there. Various installations have been erected and are working along the coast, two of these being in Spezia. Distances of 10 miles have been bridged over in communicating with war vessels, although 10 miles has been found quite sufficient for the ordinary fleet requirements. Other installations are now contemplated in this country for commercial and military purposes, and I am confident that in a few months many more wireless-telegraph stations will be established, both here and abroad.

The city of Tarboro, N. C., will hold an election on April 15th to determine the issuance of the \$300,000 of bonds for the construction of the water works and sewerage system and \$10,000 of bonds for the erection of an electric-light plant.

DEVELOPMENT OF THE TELEPHONE FIELD.

Independent Telephone "Trust."

Mr. P. C. Burns of Chicago, who went East on March 25th for the purpose of incorporating the American Independent Telephone company, which was intended to control the anti-Bell field, has returned to Chicago without having accomplished his mission. Mr. Burns refused to discuss the plans of the promoters of the scheme or give any explanation of their failure to close up the deal according to the original programme. In fact, he displayed a good deal of irritation when pressed for a statement and declared that "too much had already been published" about the project.

It is now admitted by those who are favorably disposed toward the movement that the announcement concerning the organization of the "trust" and the companies that were to be included in it was unfortunate from their view, and at least premature in the case of six large concerns, which promptly repudiated the claims of the promoters regarding their relations toward the project.

It has transpired that the options held by Mr. Blaine and his associates will expire on May 1st, and that thus far nothing has been done toward acquiring possession of the property involved. In order to take advantage of the options that have been secured it will be necessary to perfect the organization and elect officers of the new company, procure the funds with which to pay "spot cash" for the factories and business taken over, and arrange the details of management of the new concern. Much time will necessarily be consumed in the details of a transaction of such magnitude, and for this reason, no doubt, surprise was manifested at the delay in putting the plans into immediate execution.

Independent manufacturers who are not in the deal do not appear concerned over the reports that the trust will force them to the wall. The fact that they have successfully withstood the pressure brought to bear by the Bell company for years has given them assurance and confidence in their own strength.

The Detroit News, commenting on the "reported \$7,000,000 trust of independent manufacturers said to be in process of organization in Chicago," quotes A. A. McLeod, the secretary and treasurer of the Detroit Switchboard and Telephone Construction company, who said: "We have manufactured and put in over 9,000 telephones in Michigan and are now building a plant complete of 4,000 instruments in New Orleans, and we are figuring on two large eastern cities. I guess the trust will not make very much headway with the big companies." Mr. McLeod declared that the Detroit company would not join the combination.

The Pittsburg Dispatch makes the distinction that many of the companies enumerated in the list given out by the promoters of the "trust" cannot be classed as manufacturers, but should rather be termed "assemblers" or dealers who buy parts and put them together for the market. The same paper declares that it has reason to believe that the movement is in the interest of the Bell company, and that the ultimate aim of the combination is to give the Bell control once more of the entire field.

NEW COMPANIES.

A telephone company has been formed at Billings, Mont., to construct and operate a line to Musselshell, Mont.

J. F. Boydston, H. H. Boydston, Holland Boydston and others have incorporated the Platte Purchase Telephone company, with a capital stock of \$15,000, at Edgerton, Mo.

Among recently reported Illinois incorporations was that of the Macon County Telephone company of Decatur, with capital stock of \$20,000, by H. M. Whitner, C. S. Hankins and W. P. Shade.

The Green River Telephone company at Henderson, Ky., has completed its organization, with J. H. Hickman, Owensboro, president; O. W. Rash, Henderson, vice-president, and H. K. Cole, general manager.

The Harrison Telephone Toll Line company of Owensboro, Ky., has been incorporated, with a capital stock of \$3,000, by J. W. Carter of Owensboro, I. C. Adair of Fordsville and John J. McHenry of Louisville.

The Wytheville, Va., Telephone company has re-organized, with Julius A. Brown, president; Frank Owens, vice-president, and L. D. Calfee, secretary, for the purpose of rebuilding, extending and equipping the Wytheville exchange and lines.

The Home Telephone company of Dayton, O., was incorporated March 27th by H. C. Kiefaber, W. P. Sunderland, Samuel R. Harshman, F. G. Mithoff and Albert Emanuel, to operate a telephone system in Dayton and Montgomery County on \$100,000 capital.

The Wyoming County Telephone company of Castle has been incorporated to operate a telephone line connecting Castle, Silver Spring, Gainesville, Rock Gen. Warsaw, Pike, Portageville and Perry, Wyoming county, New York, and Mt. Morris, Nunda and De-ton, Livingston County. The capital is placed at

\$2,000, and the directors for the first year are Miles A. Hopkins, D. E. Van Arsdale, S. B. Windsor, C. M. Johnson, S. J. Seward Chapman of Castle and E. T. Dudley and Newbern H. Louis of Silver Springs.

The Southern Electric Telephone company of Minneapolis has been incorporated. Its capital stock is \$30,000. The incorporators are D. N. Tallman of Willmar, Charles Webster and A. C. Webster of Waucoma, Ia., David C. Jones of Minneapolis and Andrew Larsen of Willmar.

Edward J. Hall and Charles D. M. Cole of Morristown, N. J., and Edward P. Meany of Newark, N. J., have applied for a charter for the American Telephone company, which will have a capital stock of \$25,000, to construct long-distance telephone system from New York to southern points.

Articles incorporating the Frederick County Telephone and Telegraph company, Maryland, were filed in the Circuit Court at Baltimore on March 29th, and a charter was issued by Chief Judge McSherry. The incorporators and stockholders are D. C. Winebrener, James E. Walker, Frank D. Stoner, Charles B. Trail, Dr. P. D. Fahrney, Dr. F. B. Smith, Daniel T. Ordeman, William P. Maulsby, Jr., John J. Murray and Edwin Devilbiss. The capital stock of the company is \$25,000, and the duration of the charter is for 40 years. It is understood that the company has bought the plant of the Interstate Telephone and Telegraph company of Frederick City, which was established in the fall of 1895, mostly by outside capital, with L. A. Carr of Durham, N. C., president. The company has 350 telephones in use, and its lines reach nearly every town in Frederick County.

EXTENSIONS AND IMPROVEMENTS.

The Erie company is putting in long-distance telephones at Youngstown, O.

The Warren County Telephone company of Mason, O., will build a 10-mile extension.

The Indiana, Pa., Telephone company, M. C. Watson, president, will build a 20-mile extension.

The North Ohio Telephone company of New London, O., will build an exchange at West Liberty.

Announcement is made at Houston, Tex., that A. L. Waterbury & Co. will establish a telephone system.

The Lineville, Ia., Telephone company contemplates extending its wires to connect with the Clinton and Warren line.

The Home Telephone company of Plain City, O., contemplates a 30-mile extension to its present system. A. L. Seely is president.

The Ticonderoga, N. Y., Telephone company, of which W. W. D. Jeffers is president, will shortly extend to Hague and to Sabbath Days Point, N. Y.

Telephone service will be inaugurated at Greenwood, near Victoria, B. C., before July. H. W. Kent, manager of the Vernon and Nelson Telephone company, will install the system.

Charles F. Solomon and E. T. Ijams will put in a telephone system at Clifton, Arizona, and Morenci. They will include all the exchanges down the valley, connecting with Solomonville and other points.

The Diamond State Telephone company has completed its line to Harrington, Pa. The line now reaches Millford, Georgetown, Lewes, Laurel, Bridgeville, Frederic, Magnolia, Bowers' Beach, Felton and several other towns.

The Jerome, Ariz., Reporter says that the telephone line to connect Jerome and Prescott will be completed at once. Messrs. Treadwell have bought the interest of G. W. Hull in the enterprise. The management expects to put in 50 instruments in Jerome, in addition to connecting with Winningham, Cliff and other outlying places.

W. A. Feenaughty of Addison has become president of the Canisteo Telephone company of Steuben County, N. Y. The line will run from Hegeville to Cameron Mills and Rathbone, and thence to Addison, connecting with the Cameron, the Tolbert Creek, the Woodhull, the Jasper, and the Canisteo and Hornellsville lines.

The Farm and City Telephone company of Farmer City, Ill., has purchased the interest in the Citizens' telephone lines throughout DeWitt, Logan and McLean counties, J. P. Shinneman retiring from the company, and R. C. Smith taking his place as secretary and treasurer. B. F. Wasson was elected president and superintendent. The company will erect 100 miles of metallic lines this spring, in addition to the present system of 300 miles of lines.

The Home Telephone company of Lewisburg, Pa., incorporated in 1895 with a capital of \$10,000, is operating 250 telephones and has 1,000 miles of wire. It contemplates extension to Williamsport, Bell-form, Daniel and Bloomsburg, and has exchanges in Lewisburg and Milton. The officers of the company are: J. T. Baker, president; C. F. Shaffer,

treasurer, and John P. Ruhl, secretary and general manager.

The Wayne Telephone and Telegraph company, with principal officers at Clyde, N. Y., will build, this summer, a 30-mile extension. At Lyons a company has been incorporated as the Lyons Telephone company, to be operated under the same management as the Wayne. It will connect Auburn with villages in Cayuga, Wayne and Seneca counties. The capital is \$500, and directors are S. E. Bishop and A. B. Bishop of Clyde, E. G. Bishop of Rhinebeck, and C. H. Towleron, Calvin Hotchkiss, James Bashford and Clyde W. Knapp of Lyons.

The United States Telephone company of Cleveland has contracted for 2,000 miles of main long-distance telephone lines to connect with the lines of companies in the Ohio Telephone association. One line will go through Medina, Wayne, Holmes, Knox, Franklin and Delaware counties. Another will pass through Columbiana, Portage and Stark counties, while a third will go through Huron, Lorain, Sandusky, Ottawa, Wood, Lucas, Fulton and Williams, and a fourth will pass through Lake and Ashtabula counties. The main Ohio lines will start from Cleveland. Arrangements have been made for connections at the Indiana line with long-distance telephone lines of that state.

Independent Telephony in Illinois.

An account of the progress made by the Citizens' Telephone company of Woodstock, Ill., is furnished by a correspondent at that point, which has been the scene of a bitter contest between the Bell interests and the local independent enterprise:

"Four years ago the Chicago Telephone company had no opposition throughout its territory in Northern Illinois, and its rates for private telephones were so exorbitant that no business man in the small towns and cities could afford one. As a natural consequence the field remained undeveloped, but with the expiration of the Bell patents the people of at least one county in the Chicago company's territory decided to oppose the monopoly which had given them only poor service and had demanded impossible rates. This county was McHenry, and Woodstock, the county seat, grew rapidly from an exchange of 25 to one of 110, while the Bell company lost two of the five telephones which it had at one time. In Harvard, a city of 3,000 inhabitants, a score of business men organized a home company which is to-day operating 200 telephones, paying a large dividend and improving an already admirable service by devoting its surplus to the application and development of every new and valuable improvement. Marengo has had a similar experience, the local company operating about a hundred and forty telephones. In both Marengo and Harvard the Bell company is confined to the toll-stations. With the growth of exchanges furnishing service at a third of the old Bell rates came the demand for toll-lines, and this demand has been thoroughly supplied by the Citizens' Telephone company, a development of the partnership firm of Wager & Joslyn. This company has built more than 100 miles of metallic-circuit lines, connecting 22 towns and cities in McHenry County, and is building exchanges in all the larger places. It has recently begun the development of farmers' lines, for which there is a great demand in all quarters. Each farmer is made a member of the nearest exchange at the rate of \$15 a year. Though an agricultural county with no large city, McHenry will boast of a thousand independent telephones this summer. Until recently the Bell company has fought in vain for a foothold. At last, however, in one corner of the county, by the expenditure of large sums of money and putting in many free telephones, it has succeeded in establishing an exchange and inducing those who had not experienced the extortions of the old days of the Bell's undivided power to lend it a paying patronage. In the village of McHenry the Bell company and the home company have each about 50 telephones. The home company has persistently refused to cut rates, though the Bell company has put in more than 20 free telephones. The home company is gaining a steady and patriotic support from the business men who believe in trading at home and do not desire something for nothing. With this exception the Bell company has been completely vanquished by local industry, coupled with a courteous treatment of a long-suffering public. Throughout the whole Northwest the same result is being rapidly attained, but nowhere has it been more rapid and pronounced than in McHenry County, Illinois."

ANNUAL MEETINGS.

At the annual meeting of the National Telephone and Telegraph company of Fort Wayne, Ind., the following-named officers were chosen: President, George W. Beers of Fort Wayne; vice-president, C. H. Cory; secretary, D. J. Cable, and treasurer, W. H. Duffield of Lima, Ohio.

The Capital Telephone company of Sacramento, Cal., held its annual election March 21st and elected the following-named directors: President, Frederick Cox; vice-president and general manager, M. J.

Dillman; treasurer, W. E. Gerber; secretary, M. R. Beard; A. Heilbron, Frank Ruhstaller, Sr., Herman H. Grau, George B. Katzenstein, George W. Locke and A. A. Van Voorhies.

New England Telephone Notes.

[From the Boston correspondent of the Western Electrician.]

An adverse report on the bill providing for regulation of telephone charges, also on the one for supervision of telephone companies, came from the committee, but five members thereof dissent, and a warm debate is due this week on the matter in the Legislature.

The Bell telephone instrument output statement for the month of March again breaks the company's record, in both the gross and net number. It is stated that, notwithstanding the fact that the Bell company's manufacturing department is increasing its plant and employing a larger working force than ever before, the company was unable to fill its March orders for instruments within 10,000. That is to say, had the company installed all the instruments wanted the total gross would have been about 77,000 and net more than 63,000. The figures follow:

	1899.	1898.	1897.	1896.
Gross output.....	67,033	28,909	19,192	19,283
Returned.....	13,530	15,737	6,495	7,331
Net output.....	53,503	13,172	12,697	11,952
Since Dec. 20:				
Gross output.....	162,844	86,667	53,309	54,993
Returned.....	41,725	38,568	20,911	22,132
Net output.....	121,119	42,099	32,398	32,861
Total outstanding.....	1,246,365	961,220	806,247	709,397

The city of Somerville, after a protracted debate on the subject, has decided to grant permission to the New England Telephone and Telegraph company to place its wires in underground conduits.

The stock of the Michigan Telephone company was listed March 27th on the Boston stock exchange.

MISCELLANEOUS.

The Bell Telephone company of Philadelphia, which has issued common stock to the amount of \$2,616,750, without bonds or preferred stock, and is paying two per cent. quarterly dividends, has been listed at the Stock Exchange in that city.

In the recorder's office at Keokuk, Iowa, an amendment has been filed to the articles of incorporation of the J. C. Hubinger Brothers' company, by which the capital stock of the company is changed to \$1,000,000, divided into 10,000 shares of \$100 each. Of this \$600,000 is to be preferred stock.

A meeting of the Council lamp and electricity committee of Rochester, N. Y., has agreed upon a form of telephone franchise. The highest rate that can be charged per year for a telephone is \$48, and the city is to have instruments free in all its offices. The franchise shall not be transferred without consent of the council, and the council may cancel it whenever it deems proper.

TELEPHONE LITIGATION.

The Southwestern Telegraph and Telephone company, on March 25th, instituted suit against County Collector Paul Meerscheidt and the members of the County Commissioners' Court, at San Antonio, Tex., for an injunction restraining the collector from levying on its property to collect a franchise tax, and to restrain the court from assessing the franchise of the company.

Justice Cox, at Washington, March 23d, signed an order directing the taking of testimony in Richmond and Norfolk in the case of James F. Manning & Co. against the Chesapeake and Potomac Telephone company. The suit was the first one brought in equity against the telephone company, and was taken under consideration to test the act of Congress which fixed the maximum rate for telephone service in the District of Columbia at \$50 per year.

TELEPHONY ABROAD.

A heavy snowstorm prevailed at Brussels, March 28th, and in that vicinity, resulting in the complete disorganization of the telephone system. The damage done to the wires is so extensive that it is not likely that the repairs necessary to the restoration of the service can be made within a month.

The establishment of telephone service between Berlin and Paris is taken as an indication of better feeling between Germany and France than existed formerly. It is announced that two lines will be established. One of these is to pass by way of Frankfurt, the very city where the treaty of 1871 was signed. The German government has even decided to send delegates to Paris to arrange the final details.

The London correspondent of the Chicago Record under date of April 4th says: "The story reaches here that during the recent violent storm, the telephone wires between Brussels and the suburb of Ixelles being broken and communication interrupted, it was suggested that telephoning without wires be attempted. This was tried with satisfactory results, and since then the inhabitants of Ixelles have been telephoning to Brussels with the greatest ease. Electric experts here more than doubt the story so seriously set forth. Telephoning demands conditions so different from those requisite for telegraphing that they declare telephony without wires is practically impossible."

COMMUNICATION.

Brundage Telephone Bill.

To the Editor of the Western Electrician:

In your issue of March 25th I was very sorry to see an adverse criticism on the telephone bill of Representative Brundage. I happen to know Mr. Brundage very well, and went before the committee on municipal corporations, to whom this bill was referred, and heard the discussions relative to the various bills before them, at that time three in number.

There were two bills for the reduction of telephone rates besides Mr. Brundage's bill. One of these bills were introduced by the rift-raff, evidently with a view of sandbagging the telephone company; the other, I have good reason to believe, was introduced for the sole purpose of defeating the Brundage bill, and was advocated by friends of the Chicago Telephone company.

They have neatly led everybody into a trap by an article which they had published in the Chicago Tribune. If you will notice, the only item which they took up in that article was the one relating to the amount to be charged for service. The sole reason that this amount is low is because Mr. Brundage was compelled to cut it down in order to kill the other two bills. The telephone company had its emissaries on the ground at the time of the introduction of the bill, and used every endeavor to get the charge as low as possible—so low as to make the bill a failure—and when I suggested to the committee that they leave out all rates, making no mention of charges whatever, they were the first to object and insisted that the low rate be kept in the bill. The inspired article to which I refer made a great show and bluster about the rates being too low, but entirely avoided any mention of the principal item in the bill, and the one of which they are most afraid—the privilege of intercommunicating.

This is the only solution of the telephone problem. Railroad, express and telegraph companies are obliged to receive freight, express and messages and transmit them to competing companies in order that they shall ultimately reach their destination. They have no trouble in adjusting the compensation of the several companies through whose hands the business is done. Why could not telephone companies do the same?

This would at once stop all propositions tending to sandbagging or selling out, for if any company should start an exchange, as soon as it had a half dozen telephones, or less, it could begin doing business to the full extent of the needs of its subscribers, and there would be no incentive for the Bell company to buy it out, for the reason that every new subscriber of the competing company would at once add to the business of the Bell company. The Bell company would be compelled to do business on the merits of its system. If the new company had better telephones, or gave quicker service, or charged less for it, the Bell company would be compelled to do the same. This arrangement at once disposes of the threadbare and somewhat doubtful claim of the Bell company, viz., that "an increase in the number of telephones increases the expense of switching in a greater proportion," from the fact that the new company would be subject to exactly the same conditions as the old company. If the old company has 16,000 instruments and the new company 1,000, they must both prepare switching facilities to take care of a business on an exchange of 17,000 instruments, which is certainly an equitable and just position to put them in. They have in the city of Chicago 16,000 telephones. If, we will say, the Illinois Telephone company started into business, the moment they placed a telephone, that subscriber would have the use of 16,000 telephones of the Bell company. At first thought this would seem to be an injustice to the Bell company, but as they are paid for every message sent over their lines, and as they also pay the other man for every message which they transmit to him, the proportion of payments would be as 1 is to 16,000 on one side, and as 16,000 is to 1 on the other side, so that each one is paying in exact proportion to the business he is doing.

No one deplors the price inserted by the Bell people any more than Mr. Brundage, but it was absolutely necessary to get that bill out of the hands of the House committee. By submitting temporarily to that reduction in price he got the bill through the House and before the Senate. The Senate is composed of a more conservative class, who are endeavoring to serve the interests of the people. If they get reasonable encouragement from the electrical profession and the users of telephones, they will report the bill to a conference committee, which will be composed of men like themselves. Living rates will be allowed, or all mention of rates will be omitted, and the bill will become a law in that shape, providing the legislators are properly advised by the press and the people.

The clause about common carriers cuts no figure whatever. The matter is before the Supreme Court, and if it decides that the Legislature has a right to declare certain companies common carriers it will save another enactment two years hence. But if it decides that the Legislature has not this power, it will not invalidate this bill in the least.

For these reasons, and for the fact that this bill will be invaluable to the users of telephones because it will stimulate at once a healthy and honest competition and will shut off all of those companies which are organizing for the purpose of selling out,

and because a law compelling telephone companies to interchange messages is equitable and just, I sincerely hope that the Western Electrician and all users of telephones will use their influence in every way possible to advance this bill and have it become a law. Once we have competition, the telephone rates will take a decided drop, and, above all, we shall get service—a thing which we do not get now.

CHARLES G. ARMSTRONG

European Telephone Service.

A parliamentary paper has just been issued, showing the result of an investigation conducted by the English government, through its consular department, relative to the telephone service in the countries of Europe, with the view of instituting comparison with the English system. Statistics upon the New York telephone system are also printed, but no other American city is represented. The ground covered embraces all the industrial countries of the continent, and furnishes detailed information as to the chief cities of Austria-Hungary, Bavaria, Germany, Italy, the Netherlands, Belgium, Sweden and Norway, and of Switzerland. Of the French telephone service no useful particulars were obtainable; and from Russia only one example is furnished, that of Helsingfors.

Information was sought upon 23 points, which may be summarized as follows: Those relating to population and size of area; nature of concession, whether private, state or municipal; powers and rights-of-way leaves; numbers of subscribers; tariffs and hours of service; wages of workmen and operators, with their hours of attendance. To these were added questions as to the composition of the wires, the character of the circuits, and where the plant, including apparatus, was manufactured. It was also desired that copies of accounts should be obtained, with details of capital expended and profits or dividends earned; but answers on these points are either not forthcoming, or, in the majority of cases, too ambiguous to be of any value. The same may be said of answers to a question on "Quality of service, and whether the subscribers are generally satisfied?" Replies respecting the wires used are uniformly silicium or phosphor-bronze; single, as a rule, for overhead, double and of copper for underground. The plant and appliances appear to have been obtained mostly from Stockholm and Germany.

It is remarked that Italy is the principal country at all resembling New York, judging from the reports on the service in the cities of Rome and Florence. Both places are served by private companies, which are the survivors of other companies, now defunct or amalgamated, and which hold concessions from the Italian government for 25 years, commencing on January 1, 1893. These concessions are, however, subject to cancellation after 12 years on payment, as compensation, of a sum equal to the average net profit of the three preceding years, multiplied by the number of years which each concession has still to run. If undisturbed for the full 25 years, the plant, lines and offices become the property of the state. A tax of 10 per cent. is imposed on the gross profits of each concession, free communication with postal and telegraph offices, and a reduction of 50 per cent. in favor of all government, provincial or municipal offices. In Rome and vicinity the concession covers an area including a population of about 500,000. The subscription is 168 lire (\$30) annually, with an extra charge for distances exceeding three kilometers. The service is continuous, night and day. Subscribers number 2,102. About 50 women are employed at the central bureau, working seven to eight hours a day, with wages of \$6 to \$10 per month. Workmen's wages are set down at 40 to 55 cents a day, working 10 hours. The dividends of the company, which were formerly three per cent., are now, under the more secure conditions, six per cent. In Florence the same rate of wages prevails, and there is the same continuous service all night and all Sundays. A two-weeks' leave of absence is granted annually to the operators, and a holiday on each alternate Sunday. The subscription ranges from \$30, within one kilo, to \$45, within three kilos. There are about 900 subscribers in a population of 250,000. Although the law requires double wires, it has not yet been generally enforced, and single wires are the rule.

Helsingfors, in Russia, is the only other instance reported where the telephone service is in the exclusive control of a private company. The same story comes from there as from Italy, several competing companies, ending in amalgamation and a joint concession. In the case of Helsingfors, with only 80,000 inhabitants, the company obtained its privileges from the municipality on very easy terms, paying only one mark for every wire in the town; but nothing for its 16 trunk wires along the roads. It has 2,800 subscribers. The subscription is from \$25 to \$28 per annum, if the instrument and line are hired, and \$19 if they are bought. Workmen and women receive on an average 75 cents for a day of 10 hours.

Of municipal telephony the only examples presented are from the Netherlands, Amsterdam and Rotterdam having taken over in 1806 the systems previously worked by private companies, and extending in both places to a radius of 3 1/2 English miles. The concession to the municipalities is granted by the state for a period of 25 years, with option of purchase at any earlier period. The system is double wired, and is a combination of overhead and underground. Amsterdam has a population of 500,-

oo, with subscribers numbering 1,925; Rotterdam, a population of 295,000, and 1,320 subscribers. In Amsterdam each subscriber pays \$11 entrance fee, and \$38 per annum. In Rotterdam the entrance fee is rather less, and for private (not business) subscribers the rate is \$28. The service is continuous night and day. No royalty is paid to the state, the only consideration imposed being the obligation to provide all cable wires for connecting subscribers with telegraph offices and trunk lines—both in the hands of the state. The capital outlay is estimated for each connection at \$170 in Amsterdam and \$225 in Rotterdam. For the first-named place the receipts and expenditure in 1897 have been published. The surplus in that year was about \$20,000, expenditure being over \$50,000, against receipts of \$72,000. A surplus of over \$20,000 was estimated for 1898. In Rotterdam the estimate for that year is given as \$28,000—interest and redemption of the capital outlay of \$325,000 to be defrayed from that amount. The wages in Amsterdam appear to be lower than in Rotterdam. Pension for old age or when injured during service and compensation to relatives if killed are fixed by the Rotterdam Municipal Council, according to years of service and rate of wages.

Partly governmental and partly private enterprise afford the much talked-of systems of Sweden and Norway. Beginning with private associations connecting small towns and villages, merely for mutual convenience, telephony had a good start in the country districts before the dividend-paying concerns were developed in such places as Stockholm, and still more of the government system, which did not come into operation until 1891. In that city the Bell company started in 1880, the Allmänna company three years later. The competition of the government, commenced in 1891, resulted in the two systems being connected and the double wire being adopted throughout Stockholm. With a population of 271,638, the Stockholm subscribers number 19,369, of which 12,899 belong to the Allmänna company, 4,506 to the state service, and 1,964 to the Bell company. It is not clear, however, whether these figures represent separate subscribers, or whether any of them subscribe to more than one system. The tariff of the state telephone department only is quoted; but it is presumed that the three competitors' charges are alike, viz., an entrance fee of \$13, and a similar amount per annum for ordinary business purposes, but \$22.50 per annum if with the right of an unlimited number of calls. Some reduction is made for limited service, and a private telephone may be had for \$10 a year, with an entrance fee of \$3. The state appears to be earning no profit itself, but is threatening with reduced dividends its competitors, one of which (the Allmänna) used to pay eight per cent. to its shareholders.

According to the account received of the Christiania Telephone company, wages paid in that city are very low. Rates of subscription for single lines, not exceeding 1,500 meters, connected with the central station, \$22.50 per year. Extra charges are made for calls in excess of 6,000 a year, and guarantees are required for at least three years' subscription if a new line is required 500 meters from the nearest central station. Christiania has a population of 200,000, of whom 6,475 are subscribers to the company's system. Last year's dividend was 5 1/2 per cent.

From Bergen, a town of 65,000 to 70,000 inhabitants, there is a similar report of the Joint Stock company's operations, with 1,800 subscribers, and earning apparently the same amount of dividend on capital outlay. It should be noted, lastly, that for these undertakings in Sweden and Norway no royalties have to be paid to either the state or the municipality, the latter only claiming special rates for its own service.

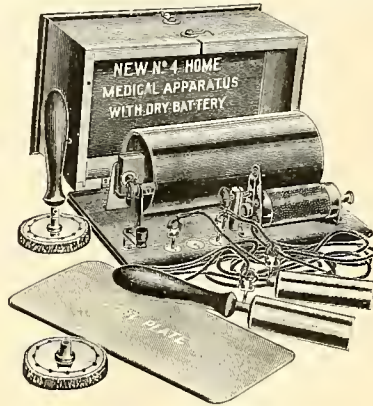
There remain to be considered only the purely state telephone systems. Of these, the German and Bavarian have been in government hands from the first; the Swiss also, except for a private venture at Zurich, which was speedily absorbed into the federal system. In Austria-Hungary, as well as in Belgium, the acquisition of the telephones was postponed until 1897 or thereabouts, the local undertakings until then being in private hands, although the trunk wires as well as the telegraphs were in most instances owned by the state.

The Vienna system extends over an area of 69 square miles, 70 per cent. of the wires being double, the remaining 30 per cent. single. The population numbers 1,400,000. At the time of the transfer there were 7,700 subscribers, which in 1897 had increased to 10,573. Within a radius of 1 1/2 miles from the central exchanges the subscription is \$42 per annum. At these central exchanges the service is continuous throughout the day and night. The female attendants are paid about \$15 a month; laborers 50 cents a day. Trieste, with 163,979 inhabitants, has 1,020 subscribers. The general circumstances are the same as in Vienna. Prague has a population of 320,805, the subscribers to telephone exchanges numbering 2,200. Wages are about the same as in Vienna. In the Prague report mention is made of telegrams destined for subscribers on the exchange are telephoned to them; also that subscribers may telephone their telegrams to the postoffice for transmission by telegraph.

In Belgium the concessions to private companies expired in 1893, when the telephone systems came under government control. Ghent, with its surrounding districts, has a population of 200,000. The

subscribers number 900, but whether this is in Ghent proper is not quite clear.

In Switzerland the telephone system has been worked by the federal government since 1881, and is considered very popular. Berne, with a population of 53,000, has 2,025 subscribers; Zurich has 157,000 inhabitants, with 4,400 subscribers; Geneva has 3,264 subscribers out of a population numbering 58,700. The underground cables are of double wire throughout; the overhead, as a rule, single wire. The tariff rates are the same all over Switzerland, namely, \$20 and \$14 for the first two years respectively, and \$8 for succeeding years, a charge of one cent being made for each communication, "thus proportioning the expense to the use made of the telephone." The following table gives some particulars of the service in



HOME MEDICAL BATTERY.

1896, extracted from the Swiss government trade returns:

Total length of lines, in miles.....	6,524
Total length of wires, in miles.....	45,969
Number of nets.....	252
Number of stations.....	23,198
Number of subscribers.....	25,090
Number of local conversations.....	13,436,198
Number of interurban conversations.....	2,729,570

From Bavaria reports have been received relating to Munich, Stuttgart and Wurtemberg; also from Frankfurt, Cologne, Hamburg, Leipsic and Berlin, all of which are, of course, under the Imperial German Telegraph Administration. The conditions resemble those in the city of Berlin, and need not be particularized. It is worth noting, however, that mention is made in the Munich report that the female operators are required to be of good education, and able to "transcribe and translate without serious mistakes at French or English dictation." Probably this rule applies to all Germany and to other countries—Switzerland, for example—as well.

The area of Berlin and suburbs, including Potsdam, has a population of 2,314,451, of whom 28,785 are subscribers to the telephone service. It has nine



FIGS. 1 AND 2. WALL SWITCH RHEOSTATS.

principal exchanges, each arranged for 5,000 to 6,000 subscribers, and 35 public stations, besides 95 at stock exchanges. By means of its trunk wires the capital is in communication with about 350 large towns, both within and without the boundaries of the empire. The system is described as single-wire throughout, each connection averaging 1.9 kilometers. The chief features of the tariff are:

(a) For each telephone instrument erected within the district of the city telephone system, and not more than five kilometers (as the crow flies) from the central exchange, an annual rent of 150 marks.

(b) For each telephone beyond the above limit, the distance within which connection is possible being decided by the imperial postoffice, for every 100 meters of additional wire, or part of that length, beyond the five kilometer limit, an additional annual payment of three marks.

For messages accepted to be transmitted by tele-

graph a general charge of 10 pfennigs is made, and one pfennig for each word. Exchanges are open from 7 a. m. to 10 p. m. Night service between two subscribers can be arranged for by an extra charge. Female telephone clerks are employed at the telephone bureaus, and have the position of officials. The girls have to be of good education and able to pass an examination. The Berlin report concludes with the following remark, which is applicable to the whole of the German imperial telephone service:

"No statistics can be given relative to the financial position, as in consequence of the union of the postal, telegraph and telephone systems under one administration, the revenue and expenditure are reckoned under one head, and separate data do not exist. The introduction of a different system of charges is in contemplation, but it is not known if the tariff will be lowered in consequence."

Frankfort-on-Main, with a population of 229,279, has 3,909 subscribers; Leipsic (398,448) has 4,294 subscribers; Cologne (321,564) has 3,784 subscribers; Hamburg city proper has 625,552 inhabitants, of whom 12,064 subscribe to the local telephone system. The service is installed for one year certain, with three months' notice after the end of the first year.

Wall Switch Rheostats.

The wall switch rheostats, herewith illustrated are especially made by the Western Electric company of Chicago for use with ceiling fan motors which have but one speed and for ceiling and desk motors running in series on 220 and 550-volt circuits. By the use of one of these wall switch rheostats three speeds can be given to a single motor or to a group of motors connected in series. A wall switch rheostat can be placed in any convenient location either near to or remote from the motor or group of motors to which it is connected. It will be found of great convenience in controlling the speeds of motors placed in restaurants and stores where it is not advisable for attendants to have access to motors while in operation, or when fans are so placed that access to them is inconvenient. Fig. 1 shows the size made for the Arctic ceiling fan on 110-volt circuit. All other sizes are made in the style shown in Fig. 2.

Home Medical Battery.

J. H. Bunnell & Co. write: "At a special term of the Supreme Court, Part Second, held in New York on March 30th, Justice Francis M. Scott granted a permanent injunction in the case of J. H. Bunnell & Co. against the Manhattan Electrical Supply company, restraining the latter from manufacturing or selling medical batteries similar in appearance or design to the well-known No. 4 D. D. Home medical battery. An accounting for damages was ordered, and on March 31st judgment therefor was entered against the Manhattan company."

Bunnell & Co. originated this battery outfit, a cut

of which is shown, several years ago, and as it was an entirely new departure, in form and otherwise, from anything hitherto produced, its introduction to the trade and medical fraternity as well as to the public was expensive. However, the manufacturers, having faith in the merits of this battery, persisted and in time were beginning to reap their reward, when, it is claimed, various concerns, seeing the demand that had been created, commenced making and selling imitations of the battery. Finally it was determined to commence suit against all infringers, beginning with the Manhattan company, which was considered the most responsible of the aggressors.

The decision just rendered in favor of J. H. Bunnell & Co. is said to mean a vigorous prosecution of all offenders, and it is understood that the attorneys for Bunnell & Co. have been instructed to immediately proceed against several other manufacturers

and dealers who are handling imitations of this battery.

It is stated, also, that the Manhattan company has applied for and received a license from Bunnell & Co., giving it the right to make and sell the battery in question under royalty.

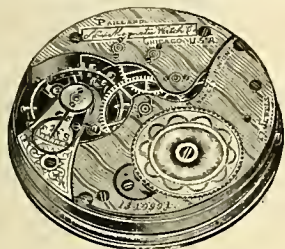
Electric Railroads in Germany.

Germany is making rapid strides in the construction of electric street railroads, according to the report of Ernest L. Harris, the United States consular agent at Eisenstock. In Meissen, Weimar and Eisenleben roads are being built; the following-named cities are planning the immediate construction of electric plants and electric street railroads: Pforzheim, Trier, Ratisbon, Colmar, Jena, Kaiserslautern and Worms. The population of the cities mentioned runs from 15,000 to 50,000 each. There are still a number of cities of this size in Germany which have no street railways of any kind. A number of towns in Saxony—mere villages a few years ago—have grown through the rapid development of industries into important centers. In many cases a single long, narrow street runs through the middle of them.

Mr. Harris suggests that concessions be sought in German cities and that American electrical manufacturers compete for the equipment of roads now contemplated.

Becken's Non-magnetic Watch.

As electricians are well aware, watchmakers have exercised great skill in adjusting watches to all influences save those of magnetism, which frequently impairs the finest regulation, and with it much of the value of a timepiece. In these days of widely distributed and powerful electro-magnetic apparatus, no ordinary watch is safe. The balance and hair spring of a watch are influenced, and these susceptible parts become disarranged. However, Carl A. Paillard, a celebrated adjuster of Geneva, Switzerland, has, after 14 years of scientific experimenting, invented a palladium hair spring and a compensation balance that



BECKEN'S NON-MAGNETIC WATCH.

are said to entirely overcome the difficulties heretofore encountered. These movements have been put to the severest tests. They can be brought into actual contact with dynamos or electric magnets, and are not affected, it is said, in action. They are entirely insensible to heat if placed on a stove. The hair spring will not rust if placed in salt water. Watches with these movements, therefore, are especially valuable to travelers, artisans, professional men, navigators, railroad and telegraph men, engineers, electricians and all residents of cities.

The Paillard non-magnetic watches are made by A. C. Becken, Chicago, in all grades and sizes. The movement is shown in the cut. Every watch is warranted to give perfect satisfaction. They are claimed to be unsurpassed for durability, workmanship and accuracy. They are made by skilled workmen; the jewels are carefully selected, the cases are exceptionally strong and of highest attainable finish, and each watch is thoroughly tested.

Electric Railways in Breslau.

The city of Breslau is about to grant a charter to the street-railroad company for a term of 24 years, with privilege of substituting electric power for horses. The following particulars are furnished by C. W. Erdman, the United States consul at Breslau: The reconstruction of the roads must be completed within two years after the contract has been approved. Overhead and underground systems are to be used. The company agrees to take from the city the necessary current for lighting and operating the cars, and the city binds itself to furnish sufficient power for this purpose, but provides that it shall not be liable for any damages in case of a breakdown at the power house. The fare is to be 10 pfennigs (2.38 cents), with transfer over any of the lines. The city is to receive from the company for the privilege and the use of the streets—after the expenses for power, engineering, keeping tracks, cars and wire in repair are deducted—33 1/3 per cent. of the receipts. After December 31, 1907, the city and company will share equally in the net profits. At the expiration of this contract the city has the right to take charge of the property of the company.

The receipts of the horse street-railway company of Breslau, during the year ended December 31, 1898, were \$367,560, or \$18,790 more than in 1897. The system has a total length of 50.018 meters (31 miles), and employs 510 horses, of which each does an average daily work of 22.69 kilometers (14 miles) in single and 25.40 kilometers (15.84 miles) in double harness. Ninety-eight closed and 40 open cars are

in use. In the course of last year 14,470,811 persons were conveyed. The salaries paid to the 472 employes amounted to \$114,440.28. The net profit was \$60,493.57, which allowed a dividend of 12 1/2 per cent.

SPACE TELEGRAPHY.

It is said that Marconi will visit the United States this fall.

Marconi is a native of Italy, and it is said that he is but 26 years of age.

In England someone has proposed the name "etherphone" for space telegraphy.

It is said that the next test by Marconi will be between New Haven and Dieppe—a distance of 64 miles.

In the recent experiments in telegraphing without wires across the English channel by the Marconi system the speed was from 15 to 17 words a minute.

Lord Kelvin is reported to have said: "I am not at all surprised at the results attained by Marconi. I believe wireless telegraphy has already become a practical success, and its future is immense. For oversea communication it has many advantages which will make it invaluable."

The Washington correspondent of the Chicago Record says that now that the Signal Corps of the army has been partially relieved of its duties and responsibilities caused by the war, Col. Allen and Lieut. Squier have resumed their experiments in wireless telegraphy, and hope for important results.

One great objection to Marconi's system is the fact that it seems impossible to guard the secrecy of the messages absolutely; another is the slowness at which messages have thus far been transmitted, and a third is the doubt whether the new method is available for great distances. However, there seems a great and undoubted field of usefulness in making possible communications between vessels at sea, one with another, and also with points on shore. Fog, wind and rain seem to make no difference in the working. The value of a practicable system of space telegraphy in a storm along the coast is very obvious.

Marconi says that the French government has given him more encouragement than any other. He contends that the cost of the new method of transmission is small compared with cabling. The whole installation by which the English channel demonstrations are carried out cost only about \$1,250. With a multiplication of appliances the expenditures would be greatly reduced. Asked if wireless communication across the Atlantic was practicable, the inventor said: "Speaking broadly, I believe so, but I have not yet made calculations with that view. I expect it would require a tower on the coasts of West Ireland and the United States from 1,000 to 1,500 feet high, with certain lengths of wire netting to catch the current and make the circuit. I don't positively affirm this demonstration is possible, as there are many difficulties, but when seriously tackled no doubt they could be overcome."

Professor Zickler of Brunn, Moravia, has perfected a method of signalling through space with ultra-violet rays of vibration. At the sending station he uses an arc light, as the electric arc is particularly rich in ultra-violet rays. The light from the lamp is concentrated by means of a concave mirror, as in the case of a searchlight, and is projected in a slender beam. A lens used in the front of the lamp to assist in the work of concentration is made of a specially selected material, a kind of quartz, which will not filter out of the light the invisible ultra-violet rays. Immediately ahead of the lens is placed a movable screen of glass, that has also been chosen carefully because it will obstruct these ultra-violet rays, although it will not interfere with the visible radiance from the arc. The letters of the Morse code or any other are signalled simply by removing the glass screen from in front of the lamp and then restoring it. The interruptions of the invisible radiance effected in this way are of such lengths and are so spaced as to fall into an intelligible scheme. Instead of opening and closing a "key," as in ordinary telegraphy, the operator uses a convenient device for altering the position of the glass screen in front of his arc light. At the receiving station a bit of apparatus is used, in which a suitable lens catches the pencil of parallel rays and focuses them. Just inside the box in whose front this lens is set there are two terminals of an electric circuit brought near to each other, but without touching. One of the terminals is a small globe coated with platinum foil. The other is a round, flat plate, having a polished surface, so as to serve as a reflector as well as an electrode. It not only helps to complete a circuit for the flow of a current through wires in the station, but it also catches the focused incoming ultra-violet rays, so that they fall in a tiny spot on the center of the disk. The disk is set at such an angle that the rays are reflected onto the globular terminal. Both, then, feel the influence of the ultra-violet rays, and are enabled to develop a stream of sparks that would not otherwise flow. This phenomenon was discovered and announced by Hertz and his followers, and upon it the Zickler system is based. The flow of the current thus promoted may be made to affect other instruments in

the circuit, such as a "sounder" or telephone or a bell. And when, by the interposition of the obstructing screen at the sending station, the arrival of ultra-violet rays at the receiving end is stopped the flow of the local current ceases. The system is a costly one, and the inventor has thus far signalled through a space of one mile only.

CORRESPONDENCE.

New York Notes.

New York, April 3.—The application of the owners of the Metropolitan Street Railway company to the Board of Rapid Transit Commissioners for permission to construct and operate the tunnel-and-viaduct railway system planned by the board for the boroughs of Manhattan and the Bronx holds a large share of public attention. The commissioners have applied to the Legislature to have the amended rapid-transit act now pending in that body further amended to give them statutory power to consider the Metropolitan proposition. In their memorial the commissioners state that the proposition is substantially as follows:

First—The routes and plan of construction prescribed by the board and approved by the municipal authorities, and Appellate Division to be adopted, subject only to modifications in detail. The plan includes tunnel construction, except at the extreme upper part of the road.

Second—Construction to begin at once on the section of the road running from the city hall through Elm street, Fourth avenue, Forty-second street, Broadway and the Boulevard to a point above St. George, and that section to be completed within three years.

Third—The remainder of the road upon the routes prescribed by the board to be built within two years after the grantee shall earn 5 per cent. upon the actual cost of the first section.

Fourth—Passengers to be carried the entire length of the road for a single fare of five cents, and to have the right to a transfer from or to any part of the Metropolitan system for an additional fare of three cents. The fare upon express trains running at a rate of not less than 20 miles an hour, and for at least two miles below Forty-second street at not less than 30 miles an hour, to be 10 cents, with right of transfer from or to any part of the Metropolitan system without additional charge.

Fifth—The grant to be in perpetuity.

Sixth—The grantee to be entitled to use side galleries and other spaces in the tunnel not necessary for railroad purposes for any wires, tubes or conductors authorized by law, and to receive rentals therefor.

Seventh—Rental to the city to be five per cent. of gross receipts, provided that the grantee shall first receive five per cent. net upon the cost of construction, such cost to be subject to proper scrutiny by the board. The grantee to be exempted from taxation until it shall have earned five per cent. on cost, as proposed to the bill submitted to your honorable bodies with the memorial of the board.

The bill embracing the final amendments suggested by the board is now pending in the Legislature.

Some of the provisions of the Metropolitan offer have aroused lively opposition. Particular objection is taken to the grant of a perpetual franchise. This is considered a "theft of the people's rights," to use the words of one speaker, and the Sun says that it is illegal anyway. Another provision regarded with much suspicion is that given under the sixth head quoted above. This clause is thought to insure the owners of the franchise a practical monopoly of the electrical distribution of the city. Such a monopoly, with the electrical utilities existing and in view, would be of incalculable value. There are many, too, who still say that the city should build the system and that a constitutional amendment will obviate the municipal debt-limit objection. Others have objected to the ten-cent fare on express trains. The compensation clause, too, has been criticized, and it is suggested that shrewd financing might not leave much for the city after the grantee had had "five per cent. net upon the cost of construction."

On the other hand, Mr. Whitney asserts that the offer made by the owners of the Metropolitan company is the best that could be made, and he says that if the support of the public is not heartily given the proposal will be withdrawn. "The Metropolitan company," he maintains, "is not going into this matter as a speculative matter. The men who are interested financially only seek a fair return for the money involved and the risks they are called upon to assume. Under the terms as set down we have figured that a fair return will be made for the outlay of \$50,000,000 on this work. Any change in the conditions which would tend to lessen the revenue would upset all calculations. All these questions have been carefully considered by our experts. The formal proposal was drafted after every point was covered."

There was a good attendance at the lecture of Prof. Elihu Thomson on "Electricity at High Pressures," before the New York Electrical society on last Wednesday evening. Prof. Thomson handled the subject with his usual clearness and exhibited interesting apparatus and experiments.

The Brooklyn Gas and Electric Light company (capital stock, \$1,500,000) was incorporated in New Jersey on March 28th. The men asking for the incorporation papers were H. S. Tourny, Maurice Landauer and Frank M. Weizman, all of New York.

It was announced last week that over 07 per cent. of the additional stock of \$18,000,000 of the Manhattan Railway company had been taken by the stockholders. The rest will be subscribed for by the underwriting syndicate.

The Metropolitan company will begin the operation of the new cross-town cars on the Twenty-eighth and Twenty-ninth street lines about the middle of the month. Compressed air is used at the motive power on these cars. H. H. Vreeland, president of the Metropolitan company, is reported to have said:

"The new system is out of the experimental stage, and I am confident of its complete success. All that hinders our opening the route is the construction of the compressor. This will be finished and ready for operation in about two weeks. The new power house is practically completed, and the new cars need only the power equipment."

Backed by R. P. Flower and his financial associates, the Brooklyn Rapid Transit company is rapidly extending its field of operations. The latest acquisition is the Brooklyn elevated railroad, which was turned over to Mr. Flower's company by the receiver on March 25th. The new owners will operate the cars by electric power and put on open cars in summer. Electric elevators at the stations are also promised. Power for the electric system will probably be taken from the existing power houses of the Brooklyn Rapid Transit company. It is believed that the Flower syndicate will ultimately secure all the railroads on Long Island. Announcement was made on Saturday to the stockholders of the Brooklyn Rapid Transit company that they will have the privilege of subscribing at par to additional stock, probably about \$3,000,000 in amount, the proceeds to go toward purchasing and electrically equipping the Brooklyn and Brighton Beach railroad and electrically equipping the Prospect Park and Coney Island railroad, and "for such additions and improvements to the properties owned or controlled by the Brooklyn Rapid Transit system as may be deemed desirable." M. S.

PERSONAL.

C. G. Luthy, general manager of the Royal Electric company of Peoria, visited Chicago Wednesday.

H. K. Gilman, general manager of the Western Electrical Supply company, St. Louis, was a Chicago visitor early in the week.

Mr. Francis Raymond has opened an office in St. Louis for the Martin J. Insull company and will sell electrical appliances and machinery.

Dr. Nicholson, professor of mechanical engineering at McGill University, Montreal, has resigned to become the head of the mechanical and electrical engineering departments at the municipal technical school now being established at Manchester, England. In his new field Dr. Nicholson will be called upon to devote himself largely to developing new lines of research in practical engineering, with special reference to industrial experiments. This will be an attempt to rival the German technical schools, which have played so great a part in the industrial development of that country.

Two presentations were recently made to Mr. C. L. Oechsner on the occasion of his leaving the General Electric company for a better position with the British Thomson-Houston company in London. The first of these consisted of a fine gold chain and traveling case by Mr. J. G. Barry, on behalf of Mr. Oechsner's colleagues in the Schenectady works. The second was made by the grand high priest of the St. George Chapter (Schenectady) Royal Arch Masons, in which body Mr. Oechsner has been a high priest. This consisted of a beautiful ruby and diamond Knight Templar's jewel. Mr. Oechsner joined the Thomson-Houston company 11 years ago, and was for some years assistant to the late Charles J. Van Depoele. After the Thomson-Houston company was absorbed in the General Electric company, he became drafting inspector in the engineering department of the latter company, and has since filled that position. He has many friends in Schenectady, both in and out of the works, who wish him luck in his promotion.

James W. Plaisted of Portland, Me., celebrated his 65th birthday and the 50th anniversary of his connection with telegraphy on March 31st. The double event was commemorated by a reception and a banquet. Mr. Plaisted in the course of his reply to the congratulations of his friends said: "There have been many changes in the business during my connection with it. There are now 31 wires between Portland and Boston, and I intend to run two more copper wires between these points during the coming summer. Fifty years ago there were no telegraph lines east of Portland, but one was built the year after I entered the employ of F. O. J. Smith between this city and Bangor. I have constructed the telegraph lines on every railroad in the state of Maine. Another thing which I am quite proud of is the fact that I ran the first telephone line in the United States from the place of business of Charles F. Williams on Sudbury street, Boston, to his residence in Somerville. I also ran the first telephone lines in Portland, Lynn, Lawrence and Bangor. I am not so young as I used to be, but I guess I will build quite a number of lines yet."

ELECTRIC LIGHTING.

Avondale, Ala., is considering a bond issue for water works and an electric-light plant.

The new Langhans filament for electric lamps, which is being introduced by an English syndicate, is said to be composed of silicon and carbon. It is not yet known whether these elements unite to form a carbide, or are merely in intimate mechanical contact. The efficiency of the Langhans filament is said to be somewhat below that of the Nernst

lamp, but it may be that improvements will bring it up to a higher point.

The Wilcox Lighting, Plumbing and Ice company will establish an electric-light plant in Wilcox, Ariz. The direct-current, low-tension, three-wire system will be used. All machinery has been ordered, and it is expected that the plant will be in operation by June 1st.

An adverse report from the committee to which was referred the proposition that Massachusetts towns and cities be empowered to absorb local gas and electric-light plants was rejected by the Legislature, and the bill favoring such authorization has been placed on the calendar.

The electric-light plant and water power at Petersburg, Va., has been purchased from the Upper Appomattox company by John L. Williams of Richmond, Middendorf, Oliver & Co. of Baltimore, Md., and associates. It is the purpose of the purchasers to furnish light and power.

The San Francisco Chronicle says that Claus Spreckels has decided to establish in that city an electric plant that will be without a rival in the world, and which will furnish to the people of San Francisco light, heat and power almost at cost. In accordance with his plans articles of incorporation of the Independent Electric Light and Power company, with a capital of \$10,000,000, have been filed with the county clerk. The directors for the first year are Claus Spreckels, John S. Spreckels, Adolph B. Spreckels, Charles E. Hume and W. K. Gibson. It is understood that Claus Spreckels will be chosen president of the company, and that it will also enter the telephone business.

ELECTRIC RAILWAYS.

T. W. Pratt of Huntsville, Ala., is interested in a project to build about five miles of electric railway in that town.

The City Council of San Diego, Cal., has passed the ordinance authorizing the San Diego, Pacific Beach and La Jolla Railway company to use electricity as a motive power in propelling cars on its road.

The Kansas City-Leavenworth Railway company (capital \$1,000,000) has been chartered under the laws of Kansas to build an electric line from Kansas City, Kan., to Leavenworth, Kan., a distance of 26 miles.

An ordinance has been adopted authorizing the San Diego (Cal.), Old Town and Pacific Beach Railroad company to use electricity as a motive power for propelling cars on its railroad in the city of San Diego.

The Dallas (Texas) Consolidated Electric Street Railway company has announced the sale of the property to a syndicate of Des Moines capitalists, the principal members being G. Van Ginkel, I. M. Earle and P. H. Bousquet. The sale was consummated on a basis of \$900,000.

A certificate by the Auburn Interurban Electric Railroad company has been filed for an extension of 16.2-3 miles from the present end of the line in the village of Skaneateles, N. Y., through the towns of Onondaga, Geddes, Camillus, Marcellus and Skaneateles, all in the county of Onondaga, to connect with lines to Syracuse.

The Cedar Falls and Normal Railway company has been incorporated in Iowa, with a capital stock of \$25,000, to build about 25 miles of electric railroad in the city of Cedar Falls and in the counties of Black Hawk, Grundy and other adjacent counties. The incorporators are C. W. McElyea, Sarah McElyea and Jennie E. Beyer, all of Nevada, Storey County, Ia.

For years the Alley "L" road in Chicago was unable to pay operating expenses and fixed charges. But electrical operation and connection with the Union Loop have put another aspect on its affairs, and the South Side Elevated Railroad company, which owns it, has declared its first dividend at the rate of three per cent. per annum. The dividend will be paid for the first four months of the year on May 1st.

By the consolidation of the various street railroads in Charleston, S. C., under the Charleston Consolidated Railway, Gas and Electric company, it is planned to use only one power house. Either the Sullivan Island power house of the Charleston and Seashore railroad or the power house of the City Railway company will be enlarged to supply sufficient power for the whole system, or a new plant will be built.

A Chicago paper chronicles this curious accident: A Division street electric-car hurled a load of hay against a city fire-alarm box at Grand avenue and Halsted street, and set off the apparatus inside. When the engines came the firemen extricated Christian Thiele, a much surprised farmer from Proviso, from his load. The wagon was righted, and Thiele, both of whose wrists had been broken, was taken to the home of friends.

The North Jersey Street Railway company, which recently obtained control of all the electric lines in Northern New Jersey except the North Hudson County railway, has completed arrangements for leasing that company's lines. The terms will not be made known for a few days. The North Hudson company operates all the lines in Hoboken, West

Hoboken, Union Hill and the townships in the northern part of the county.

It is said that contracts for building and equipping the New Orleans and Jefferson railroad have been let to the International Traction company of Detroit. The work calls for an expenditure of nearly \$225,000. The road will be 8½ miles long and will connect at Atlantic avenue with the New Orleans and Carrollton lines. A double track will be built on Napoleon avenue to the city limits, and single track to Lake City. The time for completing the road was recently extended by the City Council.

State Treasurer E. P. Shaw, who is interested to a large extent in street-railway companies, was the purchaser, for his syndicate, of the Newburyport and Amesbury Railroad company's system, which was sold out at auction on March 28th, by order of the United States Court. The price paid was \$100,000. There were several bidders, among them being the Haverhill and Lawrence Street Railway company, the Lynn and Boston and the Quincy and Boston companies. The road was bonded for more than \$270,000.

The Waupaca (Wis.) Electric Light and Railway company will build five miles of electric railroad between the city of Waupaca and the Wisconsin Veterans' Home and Chain o' Lakes. Grading is nearly completed. The proposed equipment for this road is two open motor cars and two open trailer cars, and one closed baggage car, for which bids will probably be asked May 1st. The president of the company is Irving P. Lord of Waupaca. Electricity for operating this road is to be secured by water power.

J. C. Short of New York and associates have secured a franchise from the Board of Supervisors of Chesterfield County for the construction and operation of an electric-railway line from Richmond to Petersburg, Va. The line will be built on the roadway of the old Petersburg turnpike, will be 22 miles in length, and will be for passenger and freight business. Work is to begin in 30 days and be completed in one year. The property-owners from Richmond to Petersburg united in asking that the privilege be granted, and the board's action was unanimous.

The Boston Elevated Railway company has purchased the valuable property on the water-front in Boston known as Lincoln's wharf. It is on Commercial street, near the point at which the proposed tunnel to East Boston will begin to decline to run under the harbor. The property comprises upward of 100,000 square feet of area, part solid ground and part pile structure above the water. The buildings thereon are of small value, being old and mainly of wood, but the estate is valued at nearly \$300,000. The railway company will demolish the old structures and erect a fine power house in their place, very much like the present large one on Albany street. There will be a fuel depot here also, the wharf facilities enabling the company to receive its coal by water at this point. Plans are not completed yet for the new station, but will soon be ready, with specifications for construction and equipment.

ELECTRIC VEHICLES.

The General Electric Automobile company, having its head offices in Philadelphia, Pa., makes the following announcement: This company, controlling basic patents covering the application of electrical power to independently operate vehicles of all descriptions, is now receiving orders for the prompt delivery of "horseless" conveyances of the latest and most approved types. Its specialty is the lightness of its apparatus, with storage battery one-half the weight of other makes and of greater efficiency.

It is announced that the officers of the New England Electric Vehicle Transportation company, recently incorporated in New Jersey, with the intention of operating in Boston and other New England cities, as one of the sub-companies of the Electric Vehicle company of New York, have been decided upon as follows: President, George von L. Meyer, "ex-speaker of the Massachusetts House of Representatives; vice-president, Charles L. Edgar, of the Edison Electric Illuminating company; treasurer, Thomas K. Cummins, Jr., of the Old Colony Trust company. Of the \$25,000,000 capital stock authorized, \$15,000,000 has been offered at private subscription and taken. Five per cent. was payable March 31st, and five per cent. more will be payable June 15th. The cabs, it is estimated, will cost about \$3,000 each, and 100 have been ordered for Boston and 100 for Newport.

The Chicago Electric Vehicle company was incorporated under the laws of Illinois on April 4th, with a capital of \$2,000,000. The incorporators are Edward L. Brewster, Samuel Insull and William G. Beale. "It is our purpose to run a line of electric cabs in Chicago," said Mr. Brewster recently. "Mr. Insull and I are associated in the Chicago Edison company, and we for some time have thought a line of electric cabs would be a good venture here. So we have got up this company. Our plans are not reduced to working details yet, but we probably shall put out after awhile about 100 cabs. They will be high vehicles, splendidly built, and will be on the type of a sample cab made by the Fischer Equipment company of Chicago, and that has been in service in our streets recently. I cannot say just now who will

be in the company with us, but although our papers of incorporation have just been filed, we have had applications for purchases of stock already. The cab service here is not what it should be. The type of vehicles we expect to put out already is in successful operation in Paris, and we expect to succeed well here."

INDUSTRIAL COMBINATIONS.

Articles of incorporation were filed at Trenton, N. J., on March 27th of the Consolidated Street Car company, with a capital of \$18,000,000, the incorporators being William P. Chapman, Jr., New York; A. G. Ridley, Brooklyn, and Francis D. Pollak, Jersey City. The objects of the company are stated to be to engage in and carry on the business of manufacturing street-railway cars, automobiles, omnibuses and other vehicles for conveyance of passengers, freight or express railroad rolling stock and its equipments. The New York Tribune states that this company is a consolidation of a number of the most important street-car manufacturing companies of the country. The capital consists of \$8,000,000 of seven per cent. cumulative stock and \$10,000,000 common stock.

Negotiations for the consolidation of all the street-railway and electric-light companies of Washington, except the Capitol Traction company, have been consummated, according to press reports, and the stocks of the various properties are now being transferred to the syndicate. The Baltimore Trust and Guarantee company and the United States Mortgage and Trust company of New York conducted the negotiations, and are largely interested in the purchasing syndicate. The details of the deal have not been made public, though it is understood that an issue of five per cent. bonds, amounting to \$11,000,000, will shortly be offered for public subscription. There will also be an issue of stock. The total issue of bonds will be \$20,000,000, though there will be a sufficient amount reserved in the treasury to protect underlying liens and for betterments.

An official circular, signed by W. K. Bixby, president of the American Car and Foundry company, states that the constituent companies are the Michigan-Penninsular Car company, Detroit, Mich.; Jackson & Woodin Manufacturing company, Berwick, Pa.; Missouri Car and Foundry company, St. Louis, Mo.; Ohio Falls Car Manufacturing company, Jeffersonville, Ind.; Union Car company, Buffalo, N. Y.; St. Charles Car company, St. Charles, Mo.; the Wells & French company, Chicago, Ill.; Terre Haute Car and Manufacturing company, Terre Haute, Ind.; Buffalo Car Manufacturing company, Buffalo, N. Y.; Niagara Car Wheel company, Buffalo, N. Y.; Ensign Manufacturing company, Huntington, W. Va.; Murray, Dougal & Co., Milton, Pa.; Minerva Car company, Minerva, O. The total annual capacity of the American Car and Foundry company is said to be: Passenger, 500 cars; freight, 90,000 cars; wheels, 900,000; pipe, 300,000 tons; bar iron and axles, 90,000 tons, and castings, 130,000 tons.

ELECTRICAL SECURITIES.

The Mexican Telegraph company has declared a dividend of 2½ per cent., and the Central South American Telegraph company has declared a dividend of 1½ per cent. for the first three months of the year. These companies, as is well known, are closely identified with American exporters engaged in Central and South American trade, and they have proved valuable adjuncts to this business, as well as good investments.

TECHNICAL SCHOOLS.

The annual catalogue of the Massachusetts Institute of Technology of Boston for the school year of 1898-1899 may be had on application to H. W. Tyler, 491 Boylston street, Boston. The number of students now in the institution is 1,171 and the number of graduates is 1,961. The catalogue is a volume of 347 pages, and gives very full information about the school.

The second annual dinner of the Civil Engineering Society of the Massachusetts Institute of Technology was held on March 31st at the United States Hotel in Boston, over 70 members being present. President Herbert H. Starr, '99, presided, and the guests included Professors G. F. Swain, Dwight Porter, C. Frank Allen, A. E. Burton, A. G. Robbins and P. McKibben, Bernard Herman, '99, was toastmaster.

Mr. W. N. Gray, electrical engineer and contractor of Minneapolis, lectured to the students of the College of Engineering of the University of Minnesota March 14th upon "Gasoline Engines for Small Electric-light Plants." His experience leads him to prefer the "hit-and-miss" type rather than those that take an explosion at every stroke. The engine is still capable of being improved, the main journals being generally too small to carry the weight of the large balance wheels without risk of sudden and serious "hot boxes." The best field for gasoline engines is in remote places, where transportation is so expensive that gasoline can easily compete with more bulky and heavy fuels. The control of the gasoline market by a trust is the principal source of uncertainty in the use of such fuel. Mr. Channing T. Gage of the American Steel and Wire company lectured on March 23d upon "The Manufacture of

Copper Wire," describing the interesting process of mining and reducing the ore, following the copper through the ingot to the rod and the wire. Professor Morgan Brooks of the University of Nebraska lectured on March 30th upon "Finance and Engineering," showing how the reduced rates of interest now current are affecting the engineering industries. He said that the lower cost of money enables works to be undertaken that promise only a comparatively low but sure return. Mr. J. T. Fanning, hydraulic and consulting engineer of Minneapolis, will soon lecture upon the "History and Development of Water Power." On April 28th Mr. Walter E. Snow of the Sturtevant Blower company, Boston, will lecture upon the "Influence of Mechanical Draft upon the Ultimate Efficiency of Steam Boilers."

MISCELLANEOUS.

A dispatch from Zurich, Switzerland, states that the first stretch-car on the continent to be propelled by means of liquid air was tested in Zurich on April 2d. If the reports of the experts are satisfactory, it is said that the city will remodel the entire municipal traction system so as to employ the new motive force.

The Bureau of Supplies and Accounts of the Navy Department is inviting sealed proposals, until April 11th, for furnishing the New York navy yard with a quantity of insulating tape and electric lamps. Intending bidders can obtain specifications upon application to the Navy Pay Office at New York, or to the bureau at Washington.

Among the exports declared from foreign countries to the United States for the quarter ended December 31, 1898, were the following items: Vienna, Austria, carbons, \$4,732.12; Palmerston, Canada, telephone poles, \$126.95; Cologne, Germany, detonators, \$1,938.13; Nuremberg, Germany, carbons for arc lamps, \$14,986.96; Rome, Italy, electric instruments, \$739.05.

The City Wastes Disposal company, which is organized for the purpose of constructing and maintaining works for the disposal of waste material and the building of docks, piers, canals, reservoirs, tunnels, bridges and gas, electric-light and water plants, has been incorporated. The capital stock is \$150,000, of which \$2,500 is paid in. William Lee Church, Frederick W. Garvin and Oscar L. Lefferts are the incorporators. The principal office in New Jersey will be in East Orange.

The Treasury Department is inviting sealed proposals until April 15th for manufacturing and placing in position in complete working order in the United States public buildings at Akron, Ohio, and St. Albans, Vt., combination gas and electric-light fixtures. Bids will also be received until April 12th for similar work in the public building at Pottsville, Pa. Drawings, specifications and blank forms of proposal can be obtained upon application to H. A. Taylor, assistant secretary of the treasury, Washington, D. C.

"The latest invention is a pipe line made of glass," says the Bradford Era. "The glass manufacturing firm whose plant is located at Port Allegany, near Bradford, Pa., is preparing to make glass tubes that can be used for sending oil or gas across the country, for carrying off sewage, supplying cities with water, etc. The glass pipe does not corrode, it is impervious to electrolysis in underground conduits, and, it is claimed, is less likely to leak than iron pipe. An Ohio company is now putting in such a pipe line, and a practical test of the system will soon be possible for a distance of one hundred miles."

The small magnetic pavilion set up in Greenwich Park, at a distance of 300 or 400 yards from the Greenwich Observatory, near London, is now complete. This little scientific outpost was found necessary in consequence of the disturbing effect upon the instruments of the large amount of iron which enters into the composition of the new observatory building, which is now also complete. The observatory officials have also placed in the park a declination magnet, a dip instrument for the inclination of the needle and a deflection instrument, besides thermometers, which the new buildings had shut in rather too closely.

TRADE NEWS.

Owing to great increase in business, the Cutler-Hammer Manufacturing company of Chicago has been obliged to increase its capital stock from \$50,000 to \$100,000.

All central stations have a greater or less demand for fixtures. The Western Electric company has a suitable assortment of reasonable-priced electric portables, brackets and fixtures to meet this demand.

The plant, business and patents of the Armorie Interior Conduit company of Pittsburg have been sold to the Safety Conduit company of Rankin, Pa., and the capital of the latter concern will be increased to \$250,000. The output of the plant at Rankin will be largely increased, and is expected to reach 50,000 feet of conduit a day.

The Swett & Lewis company, 11 Bronfield street, Boston, has purchased the business and good-will of the American Roentgen Ray company of Boston. It is prepared to furnish immediately anything in

the line of (1) tube machine parts and (2) X-ray tubes, fluoroscopes, spark gap tube tards, etc., as well as everything in the line of electrical apparatus.

The factory of the Haydenville company at Haydenville, Mass., for the production of brass and iron goods, for steam, water, gas and electricity, has passed into the hands of Cyster K. Sanborn of Brooklyn, N. Y., C. J. and A. S. Hill of Springfield, Mass., will be associated with Mr. Sanborn, and will remain at the factory, while Mr. Sanborn manages the New York end of the business.

W. M. Smith, the secretary and treasurer of the Chicago Insulated Wire company, has just returned from a trip through the Southwest in the interests of his company. Mr. Smith is more than pleased with his trip, as it resulted in adding a fine batch of orders to the company's already large list. The Chicago Insulated Wire company is doing a large business in its special line, and is well pleased with the outlook.

At a meeting of the board of directors of the Pratt & Whitney company, held at Hartford, Conn., March 24th the following-named officers were elected: President, Amos Whitney; vice-president, Rowland Swift, secretary, Roswell F. Blodgett, and treasurer, J. C. Stirling. The office of the second vice-president, lately held by George W. M. Reed, was not filled. The treasurer's report showed that the sales for the past year amounted to \$1,315,603.10, a net profit for the year of \$82,940.71. T. J. Nicholl of Rochester is the new managing director, taking the place of Gen. H. J. Morse of New York.

The Phoenix Battery Manufacturing company, recently incorporated in St. Louis, with a capital stock of \$250,000, one-half paid, is the successor of the Phoenix Carbon Manufacturing company. The latter company some time ago sold to the National Carbon company the department which manufactured carbon for electric lighting. It retained its battery manufacturing and other departments, and it was decided to reorganize the company and incorporate under a new name. The stockholders in the company are S. M. Dodd, J. C. Van Blarcom, James Campbell, Allen T. West, Albert Blair, S. B. Pike, S. G. Pooser and J. C. Van Blarcom, trustee.

The following description of the junction boxes manufactured by Johnson & Morton, Utica, N. Y., may be of interest to the trade: The tablet board containing all the switches and connections of the box is removable and can be placed in the box after all wiring is installed and after the interior finishing in the building is complete, thus preventing any possibility of damage to the finish of the visible parts of the box. As the junction box is the only part of a concealed-wiring installation which shows, this point is a great advantage. The concealed-wiring pocket allows the wires to be brought in through the back, top, bottom or sides of the box, as may be most convenient, making the boxes standard, independent of location of outlets. All branch circuits are supplied with detachable fuse-holders, consisting of an insulating bar with heavy copper ends which make sliding contact in substantial jaws. The use of this fuse-holder enables fuses to be replaced while current is on the box without danger of short circuits. Boxes are made standard width, regardless of the number of circuits, and are so designed that they will fit between the uprights in ordinary wooden buildings without any cutting. All copper work is highly polished and lacquered, the slate is enameled, baked and polished after all drilling is completed, and the woodwork is highly finished by hand. The boxes are easily installed and connected up, and have received the approval of the National Board of Underwriters.

BUSINESS.

The Thermo-electric company of New York reports a large call for Harrison primary cells, for which it has closed contracts for several thousand in California and the West.

The Western Electric company, Chicago, carries in stock alternating-current Stanley motors for any voltage and any frequency from one-quarter horse power up to horse power, and transformers from too-light capacity up to 300-light capacity.

The F. & L. flush push switch, which has been on the market for several years in the single-pole type, has been very successful. It is gratifying, therefore, to the Electric Appliance company, which is placing this specially on the market, to be able to announce that the double-pole and three-way styles are now ready, and that they possess the same merits of successful operation which have done so much to make the single-pole switch popular.

The Montauk Multiphase Cable company of New York is just in receipt of a large additional order from Melbourne, Australia, for its fire-detecting cable. A remarkable feature in connection with this cable is that at this long distance from the point of manufacture, subject to rough usage in transportation, it at once proved its superiority in all ways for the purposes designed. It was subjected to practical tests, calling out the fire brigade in ample time for the suppression of fire, receiving the indorsement of Chief Stein, and subsequently receiv-

ing the approval of the builders and architects of Melbourne.

Charles M. Eddy, secretary and treasurer of the Dearborn Drug and Chemical Works, Chicago, manufacturers of the well-known Dearborn compounds, reports a flourishing business. The products of the Dearborn company are well known all over the country, and are said to be in great demand. The success of the Dearborn company is due, in no small measure, to the energy displayed by President W. H. Edgar and Mr. Eddy.

The Chicago Fuse Wire and Manufacturing company announces a steady and increasing demand for its trade-mark line of tested fuse wire and links and says that its new method of packing in tin boxes has become very popular, alike with the dealer and

consumer, as it keeps the wire practically air-tight and insures against any possible danger in handling the stock. Conforming to the National Underwriters' rules, this company is placing its trade-mark on each fuse-link terminal, and it states that in this branch of the business it has also made great improvements, enhancing the appearance and accuracy of the goods. By a special improved process the company is able to reduce the cost of making and thus offset the recent advanced cost of material.

The new "99" model Emerson alternating-current fan motor promises to be very favorably received by the public this season, as it has in the past. In accordance with the policy of the maker of this motor, it is being rapidly improved in every conceivable manner, as time and usage suggest, to keep it in

the front rank. One of the novel and important improvements, among the many new features of the "99" model, is the new design of the blade, which is entirely different from anything heretofore presented in the fan-motor industry. The blade of the Emerson fan is so designed that while the speed and breeze thrown out are in no manner diminished, as is claimed, the noise of the blade cutting the air is decreased to such an extent as to be hardly noticeable. The Emerson alternating fan is being extensively handled this season by the Western Electrical Supply company of St. Louis, Mo., which, as usual, is keeping pace with the times and supplying the trade with an article of unusual merit. The Western Electrical Supply company is also meeting with large sales on the Paragon direct-current desk and ceiling fan motors, which it handled so successfully last season.

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued March 28, 1899.

621,778. Electric-lighting Gas-burner. John M. Anck, Philadelphia, Pa. Application filed March 24, 1898.

An electric-lighting gas burner consists of a body with a fixed electrode thereon, an electrode lever mounted on the burner, a member secured to the lever, insulation between the member and lever, an electrode secured to the member, a secondary lever pivotally supported and normally out of contact with the electrode member, but adapted to contact therewith when the circuit is closed and means provided for retaining the secondary lever out of contact with the electrode member.

621,807. Insulating Compound. Bruce Ford, Johnstown, Pa. Application filed January 12, 1898.

An insulating compound permanently liquid at normal temperatures is composed of a mixture of a solid asphaltic substance and an oil and having a specific gravity greater than that of water.

621,827. System of Electrical Distribution. Walter H. Knight, New York, N. Y. Application filed March 18, 1898.

This method of changing the phase of an alternating current consists in rectifying and delivering it to a storage battery and deriving from the storage battery a number of simultaneous impulses corresponding to the phase desired, the impulses varying successively and alternately.

621,848. Electric Railway. Harry C. Reagan, Jr., Philadelphia, Pa. Application filed January 8, 1896.

It is proposed to utilize a transformer, a rectifier, a direct-current motor, an alternating-current motor operating to propel the car, a battery, conductors leading from the transformer to the rectifier, conductors connecting the rectifier with the direct-current motor, conductors leading from the transformer to the alternating-current motor, conductors leading from the rectifier to the battery and devices for controlling the conductors.

621,854. Electric Hose Signal System. Howard Sargent, Cambridge, Mass. Application filed January 21, 1898.

The last claim is given: In an electric-hose signal system a line of hose having a nozzle, couplings and circuit wires along its length, and a terminal coupling, each line coupling adapted to connect the circuit wires as the hose sections are joined, and the terminal coupling comprising a body portion or shell attached to and carried by the hose, an inner insulated ring carried by said body or shell, said shell and the insulated ring constituting the terminals of the electric circuit, a double screw-threaded coupling ring of insulating material fitted to the shell and adapted to fit a nipple on the engine, a source of current and a signal connected through the shell and ring to the circuit-wires, and a suitable circuit-closer.

621,855. Electric Arc Lamp. Ruper Schefbauer, Jersey City, N. J. Application filed March 11, 1898.

In an electric arc lamp there is described the combination with the uprights of a lamp frame, a cross-piece mounted to move up and down on the uprights, a neck on the under side of the cross-piece, a socket formed on the upper side of the cross-piece, a packing washer in the socket, through which packing washer the upper carbon passes, springs for pressing the cross-piece downward, a socket at the bottom of the lamp frame, a washer in the socket, a glass globe located between the uprights of the frame, and having its lower open end resting on the washer in the bottom socket, the upper end of the globe being within the neck, on the under side of the movable cross-piece on the uprights.

621,863. Printing Telegraph. Sylvester J. Small, Seattle, Wash. Application filed November 13, 1897.

A system of telegraphing comprising a transmitter, constructed and arranged to transmit electrical impulses varying in length with each different letter, but always the same length for the same letter, a cutting mechanism whose operation corresponds with the impulses so transmitted and a printing mechanism operating at intervals corresponding with the impulses of the transmitter and the operations of the cutting device.

621,876. Electric Arc Lamp. Ernest P. Warner, Chicago, Ill. Application filed December 31, 1897.

Magnetic bodies surround the arc at such distances that the disturbing effect upon the arc of each magnetic body will be neutralized by the effects of the remaining magnetic bodies, whereby substantially symmetrical burning away of the ends of the carbons is secured.

621,907. Electrolytic Cell. Herbert H. Dow, Midland, Mich. Application filed March 5, 1897.

In electrolytic apparatus it is proposed to use an outer receptacle containing a liquid divided into two electrically insulated portions, and an inner cell covered by the liquid and having one electrode passing through each portion of the liquid.

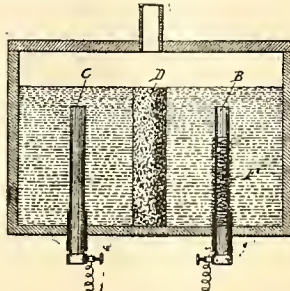
621,968. Porous Diaphragm for Electrolytic Cells and Method of Producing Same. Herbert H. Dow, Midland, Mich. Application filed September 19, 1898.

An improved method of forming the porous diaphragm in electrolytic cells consists in slowly precipitating by

drates capable of readily combining with halogens, by the action of soluble alkali (as the latter is formed in the cell) by electrolysis on a soluble alkaline earth salt, and the subsequent precipitation of another metallic hydrate substantially inert to halogens, by part of the alkaline-earth hydrate first precipitated, the method being carried out with solutions of such composition that a coherent diaphragm is formed in place.

621,924. Means for Speed Reduction of Asynchronous Alternating Motors. Karl E. F. Knauth, Charlottenburg, Germany. Application filed January 6, 1896.

The method described of changing the speed of alternating-current motors consists in changing the character of the currents in the induced windings from pluriphase to single-phase to cause the motor to rotate at near half-synchronous speed.



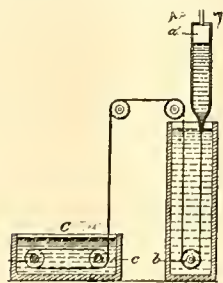
NO. 621,908.

621,963. Electric Action for Musical Instruments. William B. Fleming, Detroit, Mich. Application filed December 30, 1897.

A music sheet is provided with two series of perforations to regulate the travel of the sheet, one perforation of each pair being elongated; electric contacts are arranged to be closed through the perforations, and an electric contact may be closed through the elongated perforations in advance of an electric contact being made through the other corresponding perforations.

621,976. Overload Safety Device for Electric Circuits. Lewis G. Rowand, Camden, N. J. Application filed December 24, 1897.

An overload safety device for an electric circuit consisting essentially of an electric device in series with the circuit, having a movable member, the electric device being normally inactive, an electric device in shunt with the circuit, having a movable member, a switch upon the main circuit controlled in whole or in part by the movable member of the shunt electric device, the shunt electric device being controlled by the movable member of the series electrical device and adapted to become active when the series electric device becomes active.



NO. 622,087.

621,984. Trolley-catcher. Oliver W. Whitehead, Dayton, Ohio. Application filed July 18, 1898.

In a trolley catcher there is the combination with a spool upon which the trolley rope is wound of a spring controlling the spool to keep the trolley rope taut, and a spring of greater strength to control the spool to draw down the trolley when the latter leaves the wire, mechanism for placing the spool under the control of the stronger spring, and an enlargement on the trolley rope adapted to actuate the mechanism when the trolley rope is drawn from the spool by the trolley when the latter leaves the wire.

622,075. Protective Fuse. Emil B. W. Reichel, Berlin, Germany. Application filed September 29, 1898.

The fuse is connected between terminals, a base supporting the terminals, a slide engaging the fuse, a cover for protecting the fuse parts, a spring carried by the cover adapted when the cover is in place to engage the slide and exert thereon pressure, and an inclosing receptacle carried

by the cover containing a portion of the spring, another portion of the spring extending through the receptacle and engaging the slide.

622,078. Means for Generating Electricity from Machinery of Locomotives. Harry F. Roach, St. Louis, Mo. Application filed January 23, 1899.

The mechanism described for rotating the armature of a dynamo mounted on the main framing of a locomotive, comprises the following elements in combination: A dynamo, a crank shaft for driving the armature of the dynamo, a link connected to the crank shaft, a bracket mounted on the main framing of the locomotive and formed with guideways, a cross-head mounted in the guideways to which the link is connected, a rock shaft mounted in the bracket and provided with a rock arm, links connecting the rock arm and the cross-head, a main rock arm mounted on the end of the rock shaft, the cross-head proper of the locomotive, and a link connection between the cross-head and rock arm.

622,087. Filament for Incandescence Electric Lamps. Charles H. Stearn, London, England. Application filed August 11, 1898.

The process of treating a solution of cellulose known as "viscose" for the manufacture of filaments for incandescent electric lamps and similar bodies consists in first agitating and filtering the solution, and then projecting it from an orifice of suitable shape into a precipitating solution.

622,116. Electric Switch. Max H. Caspari, New York, N. Y. Application filed February 25, 1898.

An electric switch comprising a horizontally disposed casing, a line terminal passing through the lower part of the casing, a second insulated terminal entering the casing at a higher elevation than the first one, and an extension of the casing hinged thereto and adapted to be raised above or also below the main casing, the two being connected through the hinge and being partially filled with a conducting liquid.

622,124. Secondary Battery. Walter A. Crowder, Chicago, Ill. Application filed June 8, 1898.

A supporting plate or grid with its complementary active material, a flexible porous envelope arranged in a thin sheet and surrounding the plate, and a perforated separator composed of a sheet of porous material arranged to fill the space between the elements and hold the flexible envelope in contact with the plate, are combined.

622,144. Electric Propulsion of Railroad Tramway, or Other Similar Vehicles. Jean J. Heilmann, Paris, France. Application filed September 21, 1898.

In an electric locomotive there is the combination with an axle and its axle boxes of a truck frame having pedestals to receive the boxes and provided with perforated lugs notched in their under sides, springs resting on the boxes, hangers attached to the springs and passing through the lugs, and collars on the hangers having ribs to enter the notches in the lugs.

622,151. Electric Incandescent Lamp. Charles Howard, London, England. Application filed May 7, 1898.

This lamp has an elongated neck, projections on the neck, a cap having notches or gaps to receive the projections, a wire extending around the lower edge of the cap below such projections, and turned-up corners on such edge to engage the wire.

622,177. Electrical Knob. Cornelius M. Brown, Newark, N. J., assignor of one-half to George Watts, Plainfield, N. J. Application filed February 26, 1898.

The improved knob for doors has a chambered body with a front and a side opening, a sliding front-plate receptacle recessed and perforated, an electric push-button with its forward end projecting through the perforation and resting against the rear side of a front transparent plate, the transparent plate and electrical devices acted on by the push-button, the plate or plates adapted to be removed or interchanged and be pressed backward and drawn outward at the side opening of the chamber.

622,186. Railway Advertising Apparatus. Charles J. Feder, Paterson, N. J. Application filed December 28, 1898.

The advertising apparatus is carried by the car and consists of a revoluble sign, an adjustably mounted electromagnet or magnets, an electric circuit including the magnets, and a revolving member of the running gear of the car, the member constituting a circuit-making-and-breaking device, an armature lever, an armature adjustably mounted on the armature lever and controlled by the magnets, and operative connecting means between the armature lever and the sign.

622,188. Keyless Switch-socket for Incandescent Lamps. Max Meyberg, Los Angeles, Cal. Application filed November 14, 1898.

In a lamp socket there is the combination with a plate of a cap-piece thereon, the lower edge of which is turned outward, a sleeve over the cap-piece, the upper edge of which is turned inward, and screws through the cap-piece into the plate above the edge of the sleeve.

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No. 15

Patton Automobile Truck.

The automobile truck illustrated on this and the next page is interesting from its large size, and from the fact that it is electrically operated and yet self-contained, generating its own power. It was built for the Patton Motor company by the Fischer Equipment company, and has seen considerable service on Chicago streets. It illustrates the Patton electric-motor system, which W. H. Patton of Chicago has been exploiting, more particularly for railway operation, for the last nine years. Mr. Patton's idea is to use a combination of gas or gasoline engine, electric generator, electric motors and storage battery on each motor-car or other transportation unit. This naturally seems a cumbersome and un-

and under all conditions, and also to reinforce such engine with the necessary flexibility of power."

As shown by the pictures, the truck is very substantially built for heavy work. It is 12 feet long, 5½ feet wide and weighs, with machinery but without load, about 3½ tons. It carries loads of two or three tons without difficulty. The wheels turn on ball bearings and have iron tires ¾ inches wide, although solid rubber tires are to be substituted. Frame, springs and all parts of the wagon are of exceptional strength and solidity.

Power is obtained from a three-cylinder gasoline engine, made by the American Motor company, direct-connected to an eight-kilowatt, 125-volt, six-pole Crocker-Wheeler dynamo. This set, placed

partly from the wagon body, drive the rear wheels (one for each wheel) through double-reduction gearing. Two band brakes are supplied, one for each motor shaft. These brakes are actuated by foot pressure exerted at the driver's seat and are of sufficient power to control the movement of the wagon with perfect safety. The storage battery consists of 55 Willard cells of 120 ampere-hours' capacity each. It is placed in a box built under the wagon, between the front and rear axles and behind the engine. The steering gear is clearly shown in Fig. 2. It consists of a large hand-wheel mounted on a shaft having a pinion engaging in a rack attached by steering knuckles to the hubs of the front wheels.

The controller for the motors is upright and iron-



FIG. 1. PATTON AUTOMOBILE TRUCK.

necessary method of transmitting power, but Mr. Patton says that he unites the economy of the gas engine at steady average load with the flexibility of the electric system, and that the combination shows a satisfactory efficiency with all the advantages of self-contained units. Mr. Patton argues as follows: "The gas engine of itself has not the necessary flexibility of power, and would not work under such conditions with any degree of economy, for it is a well-known fact that these engines must work at about normal load to give good results, and that any great overload is refused by their stopping; and it is also a well-known fact that in overcoming train inertia nearly twice the power is demanded over that required to maintain ordinary momentum, as it is also a well-known fact that on varying grades and conditions the power demanded of the engine often runs far below its normal capacity. Knowing these facts by actual experience with gas engines, the Patton electric-motor system was designed with the purpose of balancing up the load for the engine so that it might have a constant load factor at all times

lengthwise of the wagon, is installed well forward in the truck and under the level of the wagon seat. It is partly above and partly below the floor of the wagon box. The dynamo is attached to one end of the engine shaft and a moderate-sized flywheel to the other. The engine and dynamo turn at 500 revolutions per minute. The cylinders are upright. The generating unit is shown clearly in Fig. 2 on the next page, the front panel of the wagon box being lifted up for the purpose. Electric ignition is used, the coil being actuated by current from the storage cells. The water tank for the gasoline engine is under the engine and directly in front of the battery tray, shown depending from the middle of the wagon in Fig. 1. A small pump connected with the engine circulates the water through the tank and many feet of brass piping on the outside of the sideboards above the wagon box and the foot-board of the driver, by which means the water is cooled. The gasoline tank, with a capacity of 15 gallons, is under the seat.

Two four-pole motors, said to be of 7½ horse power each, suspended partly on the rear axle and

clad, like the controller of an electric-railway car. It is placed in front of the driver's seat, as shown in the pictures. It is arranged for three speeds—three, six and eight miles an hour. Back of the controller, on the seat, is the reversing switch. A starting box is placed under the seat on one side. This is used in starting the gasoline engine, when the dynamo is run as a motor by the battery current until the engine runs by its own power, and the speed becomes sufficient to reverse the conditions.

The controller, dynamo and batteries are connected in multiple, so that the dynamo is driven at a nearly constant load, the current being taken by motors or batteries as the demand of the load varies. When the load is light the surplus goes into the batteries, and when there is a heavy demand for power the battery adds to the capacity of the dynamo.

Some tests of the performance of this truck have been made, but they are not available for publication. It is said that the engines take about 1¼ gallons of gasoline an hour, but exact data of speed and load vary greatly according to the pavement and have not been tabulated.

Detroit Street-railway Ownership.

[Correspondence of the Western Electrician.]

Detroit, April 10.—The enormous street-car sale in Detroit presents some unusual phases, in that it marks the termination of a long series of defeats, on part of Governor Pingree, in his former attempts to bring about the municipal ownership of street railways. But, at last, he is on the very edge of succeeding. The story is a most interesting one.

A commission of three—Governor Pingree, Carl Schmidt, a millionaire tanner, and Elliott G. Stevenson, a silver-democratic lawyer—has absolute power, under the McLeod bill, recently signed by the governor, to buy the 180 miles of street railway in Detroit, now owned by R. T. Wilson of New York and by Tom Johnson of Cleveland. The principal provisions of the bill are as follows:

A commission of three, to be appointed for terms of two, four and six terms each, and their successors for six years each, with power to buy the street-railway system for the people; aldermen are ineligible; each commissioner to be under \$250,000 bonds; the city treasurer to be the custodian of all moneys of the street railway and for the purchase and operation of the system; power expressly granted for the commission to acquire, at its discretion, by lease, purchase or otherwise, the 180 miles of street railway in Detroit, also all suburban lines that may be deemed necessary to operate these roads, as a private business, in behalf of the people; debts for possible shortages are not to be charged to the people, but to the street-railway properties; universal transfers and the lowest possible fares, after all expenses are paid. If the properties, several years hence, revert to the present owners, the city having made a trial and abandoned the experiment, it is expressly stipulated that the commission is to have no power to extend the franchises before handing them back. The last clause is deemed most important, for had franchises of the Johnson-Wilson company a long time to run, there is small doubt that the roads would ever have been offered to the city. As it is, the franchises average only 10 years. When the Johnson-Wilson roads were bought, some four years ago, an effort was made to have the expiring franchises extended 30 years, but this was impossible, on account of the three-cent fare agitation of Mayor Pingree. The three-cent road built under the franchises he gave ran successfully for a time, but was suddenly, without adequate explanation, sold to the Johnson-Wilson people, who now control in the whole city 180 miles of electric system. It has always been given out that the reason for the transfer was that the three-cent roads did not pay; but, as the books of the company were never produced, the people have always questioned the statements, referring to them as an invention of the street-railway people to prevent the further spread of the three-cent-fare heresy.

The passage of the McLeod bill raised a storm of protest from many Detroiters, who see in it too much eagerness on the part of Pingree to take over the roads at enormous cost to the taxpayers. At present all is awaiting the reports of the special appraisers, and, in the meantime, various experts are giving their estimates of the probable cost of the transfer, the sums varying from \$5,000,000 to \$12,000,000. General opinion seems to be that the entire 180 miles of electric system and equipment could be duplicated for less than \$4,000,000. Among the appraisers for the people will be Professor Beaman, electrical expert from Kansas University, and Professor M. E. Cooley, engineering and electrical expert, University of Michigan. The railway company has not yet given up its books, but attests its willingness to do so when the three commissioners are ready to act.

Tom Johnson refuses to talk on municipal ownership. He has four sumptuous rooms at the Russell House and travels with his valet, S. B. Clark, a keen lawyer from New York, is with him. Mr. Clark is said to know more about the legal phases of street-railway franchises than any other man in this country. He was a former partner of Elihu Root. It is supposed that he will draft the papers when the street-railway commission takes charge for the people.

Governor Pingree expresses himself as well pleased. He says the first thing he will do, after control, is to shut off all free-pass books, now in the hands of city officials and the press, which, he declares, represent a loss to the company of \$233,000 a year. "With no watered stock to be cared for, and only legitimate expense, there can be no possible doubt," he says, "of the coming for good of three-cent fares. Rates will gradually be reduced till they are at the lowest possible notch, less the actual cost of running the road. Will they reach a straight three-cent fare? I am sure of it. A civil-service examination will be made to keep the road out of politics. There will be no change in the method of operation for the present."

As soon as the appraisers appointed by the commission file their reports, the commission will go ahead and buy the road, at whatever figure it thinks just and fair. Not a straw is in the way of closing the deal. Under the McLeod act, the commission has full power to act.

N. C. Goodwin, a street-railway manager of 23 years' experience, says that, in his opinion, the Detroit electric railway system is worth \$6,500,000, and that it is bonded for \$11,000,000; and that if the city buys the road, it will have to pay the bonds.

Tom Johnson has thus far refused to be inter-

viewed. When asked what, in his opinion, the road is worth, he deftly turns the conversation.

The McLeod bill will doubtless be fully carried out within the next two or three weeks, and the great experiment of municipal ownership on a brilliant scale will have its first practical test in the 180 miles of electric street-car lines of Detroit.

The appointment of the McLeod commission is considered a great personal victory for Governor Pingree, who raised the question of municipal ownership in 1889, and who has been hammering away at it, in season and out, for the last 10 years. When a three-cent road was started in Detroit, in 1895-96, Johnson tried to get an extension of his five-cent franchises, but Pingree refused, unless a three-cent fare was attached. The three-cent road was somewhat mysteriously absorbed by the Johnson-Wilson syndicate about a year and a half ago, and Wilson and Johnson immediately set to work to make a three-cent rate very unpopular. This succeeded well, until it was found that the average life of the five-cent franchises was only about 10 years. This made

Expansion of Electric-vehicle Interests in Chicago.

For some time Mr. Samuel Insull, president of the Chicago Edison company and prominently identified with electrical manufacturing interests, has been investigating the merits of and probable demand for electrically propelled vehicles. Satisfied that the field is one of much importance, Mr. Insull, with the co-operation of Frederic Nicholls of the Canadian General Electric company of Toronto and other business men of that city and Chicago, has secured the incorporation of the Woods Moto-vehicle company of Chicago, which will absorb the already successful business of the Fischer Equipment company of this city and greatly extend the business, building self-propelled vehicles for business and pleasure under the patents of C. E. Woods.

The certificate of incorporation of the new company was filed in the secretary of state's office at Trenton, N. J., on April 10th. The authorized capi-

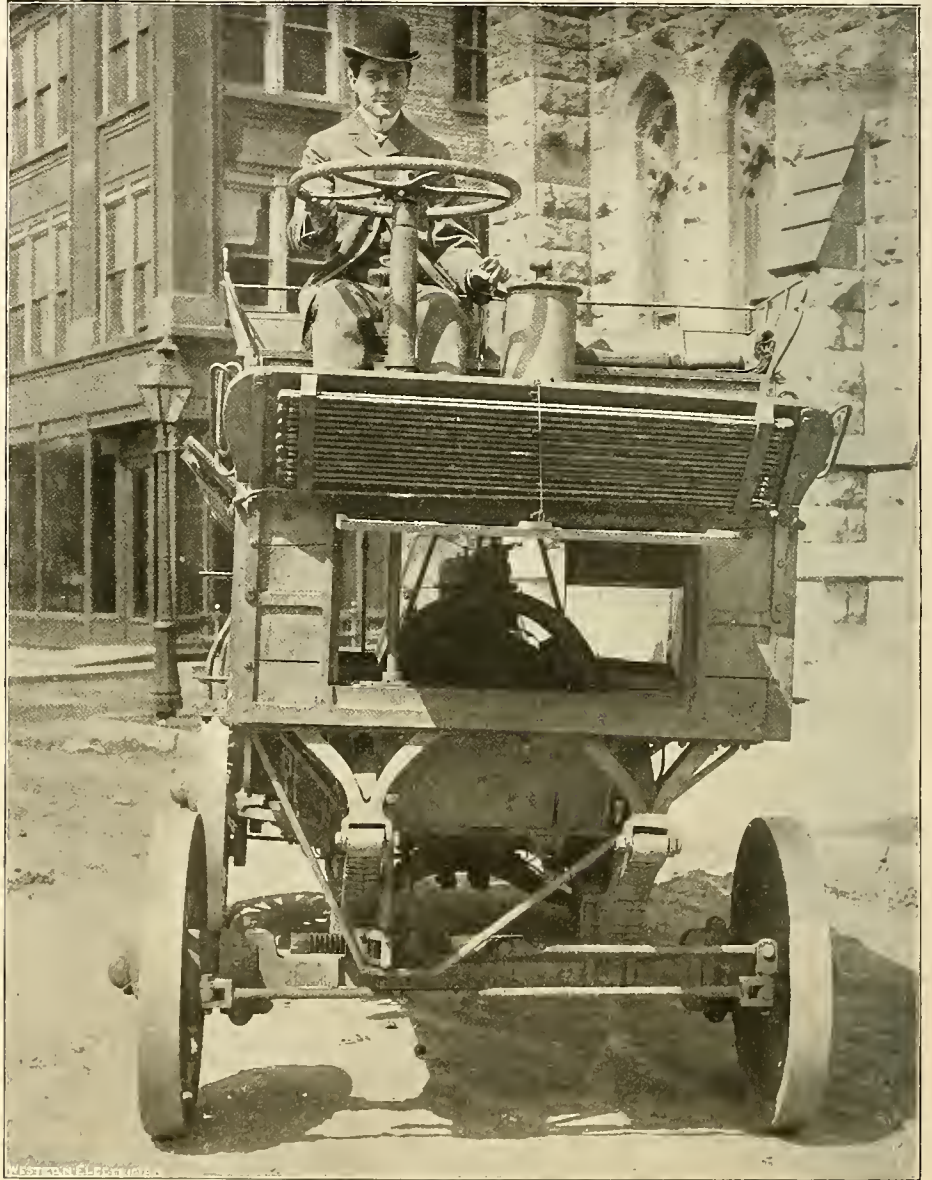


FIG. 2. PATTON AUTOMOBILE TRUCK

it impossible to bond the road, and in turn Johnson and Wilson decided to sell out to Pingree. Pingree, seeing a chance for his three-cent ideas again, was only too happy to have the necessary legislation passed. By many Detroiters the whole enterprise is looked upon as but another wheel in another gigantic Pingree political machine. G.

Street-railway Situation in Indianapolis.

The franchise contract between the city of Indianapolis and the Indianapolis Street Railway company has been signed and ratified. By it the company secures a grant for 34 years and agrees to pay the city within that period \$1,160,000 and grant a four-cent fare where tickets are purchased in lots of 25 or more. The people of the city, with slight exceptions, are greatly aroused over the grant. Much talk of "crooked work" is afloat. The popular demand was for a shorter franchise and three-cent fare. C. F. Smith, D. M. Parry and Frank A. Maus, said to be three men of financial standing, had proposed to take a 30-year franchise with a three-cent fare and at the same time pay into the city treasury more than the successful company pays.

tal is \$10,000,000, of which \$2,500,000 is to be preferred stock and the remainder common stock. Beside Messrs. Insull, Nicholls and Woods, the gentlemen interested include George A. Cox, A. E. Ames and H. P. Dwight of Toronto and S. M. Fischer of Chicago. Mr. Insull will be president of the company, Mr. Nicholls vice-president and Mr. Woods secretary and managing director. The headquarters of the company will be in Chicago, and the existing factory in this city will be retained and extended or a new one procured. It is said that factories will also be erected in Cincinnati, Philadelphia and Toronto.

While the Woods Moto-vehicle company will do a general manufacturing business in the automobile line, extending its operations over the whole country, it will be closely affiliated with the Chicago Electric Vehicle company, the incorporation of which was noted in the Western Electrician last week. This company, formed by Mr. Insull, Edward L. Brewster and W. G. Beale, all of whom are likewise interested in the Chicago Edison company, will operate electric cabs on the streets of Chicago and will undoubtedly use Woods equipments.

Methods and Tools in the Electrical Repair Shop.

By B. F. FELLO.

Among the leading causes of defective service in a dynamo or motor are rough and improperly adjusted commutators. We have had commutators brought to the shop in the condition shown in Fig. 1. Here the scarred and ridged condition is plainly seen. It is well known to electrical machinists that when a commutator is found so badly cut as that shown in the sketch the armature should be removed and the commutator turned off. But some neglect to do this. It can be done very easily by simply centering the commutator in the lathe. Only a small shaving should be taken off, just enough to true the surface. In case the commutator is but lightly scored, a fine file can be used for dressing, finishing with sandpaper.

In order to make sure that the commutator is true, it should be tested in its own bearing and with the brushes on. The cylinder may be turned slowly by hand and the least roughness or irregularity detected by the action or the rise and fall of the brushes. Fig. 2 shows the same commutator when turned down. The brushes and their setting are also indicated. In Fig. 1 the brushes are marked B. B.

As is known, when the brushes are adjusted too far out the safety fuse is likely to blow, and the dynamo will fail to make a satisfactory output. As it is practically impossible to get a perfect adjustment of the brushes if the conditions are as shown in Fig. 1, the necessity of keeping these parts in good order is obvious. Sometimes the brushes have been worn to a condition corresponding to that of the commutator, while at other times the connections are at fault.

A commutator which has become gummed with oily substances will cause a poor contact. Loose brush-holder screws are sometimes found; many brushes loosen and tip out of level, so that the contact is defective. Again, the tension springs may fail to serve their purpose. Usually the trouble is due to the springs losing their temper. New springs should be put in. Clogging of bearings is a common imperfection and the direct cause of much trouble. If a loose bearing gathers dust and gum, the foreign matter packs on one side, throwing the shaft out of line to a slight degree, enough to disturb the alignment and produce endless difficulties. The best way to prevent this difficulty is to make sure that all the journals are thoroughly cleaned of foreign matter previous to any alterations in the setting.

Some dynamo tenders prefer a very glossy finish on the commutator; others aim at perfect smoothness to the touch, but no gloss.

ARMATURE-COIL SHORT-CIRCUITS.

The short-circuiting of armature coils is frequently due to simple defects, such as the accumulation of copper dust back of the commutator, the presence of pieces of metal between pole-pieces and armatures, oil-and-dirt balls, etc. Injuries to the insulation of the wire must, of course, be avoided. A careful inspection and test should be made at intervals with a view of locating and ejecting foreign deposits. A knife blade is a good tool with which to scrape the mica insulation between the segments with the view of cleaning it. If the short-circuit is due to a defect in the insulation of the wires of the armature, each wire should be lifted and wound with silk tape. In replacing the wires, care should be taken to get the strand back into its original position, using a mallet or soft-metal hammer for the purpose. Then put a coat of shellac on the portion repaired.

BEARINGS.

When overhauling a commutator, all bearings should be looked over for worn and loose places. Chattering of the brushes and consequent sparking and cutting will be avoided by keeping the bearings tight. Rebabbiting may be resorted to if the parts are worn. In some cases new sleeves can be put in.

TOOLS.

There is much chipping of metals to be done in all railway repair shops, and hammers of proper weight and proportions should be provided. Fig. 3 is a 1 1/4-pound head, Fig. 4 a one-pound head and Fig. 5 is a light head for chipping on soft metals. The first two can be purchased of dealers. The last is provided with a head made with lead hardened with tin and put into the channel, as shown. The weight of this head is 12 ounces. Stiff blows may be struck the cold chisel with this hammer, and the elasticity of the hardened lead will soften the stroke.

The pattern of chisel with which the best work may be done is a perfectly straight one. Curved chipping chisels are not a success. The first bevels of the chisel should be alike on both sides and the second or ground bevels should also be alike. With a chisel of this form, well tempered and ground, and either of the hammers described, a good job of chipping may be done.

REPAIRING STEEL ROLLS.

Steel rolls and shaft frequently require new bearings. If the old bearing end is broken off, or so badly worn as to require a new end, I chip out a hollow in the base and set up the shaft in a dry-sand mold C, Fig. 6. The dry sand is provided with a tap at F, and the soft metal finds an outlet there and falls to the receptacle G. The clearance in the flask B should be rammed with sand. The outline

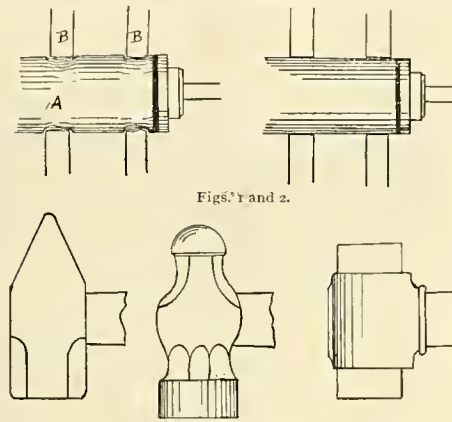
of the lower part of the shaft is indicated, and this section can be accommodated in a pit dug in the ground. Surplus metal can be run off through the channel E.

After casting on the new end, I turn the piece down in a lathe and get it as true as possible. In setting up, the utmost care must be taken to get the steel rolls level. The spindles should be plumb, and this ought to be accomplished without resorting to the use of paper under the bolster flanges. The bolster should be a close fit, and no adjustment ought to be necessary. This means correct workmanship. It is often necessary to tip the spindles to bring them concentric with the center of the ring. This is wrong, as it many times throws the spindles out of plumb. There should be no occasion for this expedient.

Electric Traction on Highways.

By JAMES ASHER.

In the system which I propose there are two trolley wires over the road. There are two of Siemens' bow trolleys extending from the motor wagon to the wires; one trolley presses against the lower surface of one wire, and the other trolley presses against the other wire. Each of these bows corresponds to the trolley wheel which is used on American railways. It will now be understood that the current from the distant dynamo arrives at one bow trolley by one of the overhead wires, then it descends to the motor on the wagon and ascends along the other trolley, enters the other trolley wire and returns to the dynamo at the power station. This method of leading the current of electricity to and from the electric motor allows great lateral deviation on the part of the motor wagon and renders feasible a simple overhead construction at corners. The trolley wires may be several feet apart.



Figs. 1 and 2.

Figs. 3, 4 and 5.

METHODS AND TOOLS IN THE ELECTRICAL REPAIR SHOP.

One loaded wagon, bearing an electric motor, can draw several other loaded wagons. Thus some of the advantages of an electric railway may be secured without the great expense of ties and rails. Much steeper grades can be ascended than is the case with electric railways. A motor wagon can draw a dozen wagons bearing heavy loads. The motor wagon may be of 25 horse power. Several neighbors might frequently unite in the formation of a train of wagons to convey grain or other produce to market to a distance of 30 miles. Only one person would be needed to manage the whole train.

This system would possess not only the cheapness of the trolley system, but also the ability to draw enormously greater loads.

In winter, when the ground is covered with snow, the motor wagon can draw goods and passengers on a train of sleighs.

Light carriages bearing electric motors and trolleys may be electrically driven. Horseless carriages having storage batteries may have these batteries recharged by making a connection with the overhead wires. Thus, on common roads, the work usually done by horses can be electrically performed with facility, speed and low outlay.

Philadelphia Exposition.

Dr. Edmund Cobbe of Philadelphia is in Chicago in the interest of the Philadelphia Exposition, which is to be held in September, October and November under the auspices of the Philadelphia Commercial Museum and the Franklin Institute. This exhibition will be devoted entirely to the display of American manufactures especially suited for export trade, and an opportunity will be afforded to compare American products with articles made in foreign countries. Agents of the exposition abroad have been purchasing samples of articles with which Americans compete in foreign markets. No foreign exhibitors will be given space in the exposition, as the exhibition is intended to promote American industries. The plan of bringing foreign merchants to this country to inspect the factories and products of the United States, which resulted so satisfactorily in June, 1897, will be adopted this year, when the Second International Commercial Congress will be held. Dr. Cobbe says that the electrical section will be representative of the advancement that has been made and that several large houses have already made

application for space. One prominent manufacturer asked for 6,000 square feet, but this was not allowed, as only 20,000 square feet will be assigned to the electrical exhibits. An effort will be made to avoid duplication of exhibits, and each manufacturer will be asked to make his exhibit as compact as possible.

Commercial Field for Liquid Air.

[Special correspondence of the Western Electrician.]

Detroit, April 8.—In an interview on the probable application of liquid air to the street railway and electrical business, Professor Freer, the leading authority on chemistry at the University of Michigan, says: "It will have a great effect on electricity, although no man can yet figure out the result. It may entirely change our system of electrical conductors. You know, at a certain point of low temperature, one conductor is as good as another; lead is as good as iron, steel as good as copper; the intense cold makes all metals of equal value as conductors. Now, heretofore our chemistry of low temperatures has been developed on a basis of only 70 degrees below zero; but liquid air is at least 312 degrees below."

"Do you think," he was asked, "that liquid air will supplant electricity?"

"It is extremely unlikely," he replied, "because liquid air cannot be made commercially efficient unless we burn coal to produce it. I think its use commercially is restricted to free, natural sources of power, as water power, where it can be made cheaply. I do not take any stock in Tripler's exaggerations as to the whole world being run in the near future with liquid air."

"What about Tripler's statement that three gallons of air can produce to gallons of liquid air, and so on, continually?"

"It's like trying to pull yourself up with your boot-

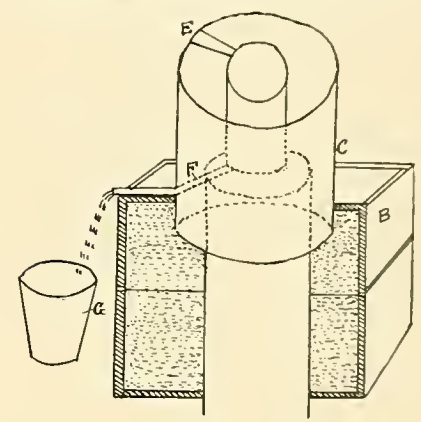


Fig. 6.

straps. It is absurd. It is a physical impossibility. It is the old dream of perpetual motion in a new, pleasing form. If three would produce 10 we might go on forever and eventually liquify all the air about the earth. There is nothing in the theory."

Samuel Insull's Manufacturing Interests.

Samuel Insull is once more to be identified with important electrical manufacturing interests, this time under his direct control and ownership, and those who are familiar with his aggressive business policy realize that he will take a commanding position in this field at once. Mr. Insull enjoys the advantage of extended acquaintance with this branch of the industry, and his invariable success inspires confidence in his new undertaking. He has been in New York during the last week closing up the negotiations for the acquisition of several important lines which he will hereafter control. Mr. Insull stated positively that he would remain in Chicago at the head of the Edison and the Commonwealth companies, and he dismissed as an idle compliment the rumor that he was to take charge of the central-station work in New York under the Whitney syndicate. He also denied most emphatically the reported negotiations for the sale of the Chicago Edison property to the Chicago gas interests.

Mr. Insull admitted, however, that he was preparing to engage in the manufacturing business on a large scale. He confirmed the report of his acquisition of the electric-vehicle interests in Chicago, noted elsewhere in this issue, and his purchase of the greater portion of Mr. Sigmund Bergmann's interest in the General Incandescent Arc Light company, in which he formerly had only a minority interest. He has also acquired the whole of the capital stock of the New York Electrical Equipment company, which will virtually be owned by the General Incandescent company and operated under the same management, doing a construction business as heretofore, but reaching out now in its operations as far west at least as Buffalo and Pittsburg. The General Incandescent Arc Light company will go on manufacturing the same line of goods it has made heretofore, which involves no interference with the work of the larger manufacturers. There is an immense domain of smaller specialties to be filled up, and it is this branch that the company will develop. Small sizes

of dynamos and motors will be made, but particular attention will be given the minor articles of all kinds needed by illuminating companies and their customers. The officers of the General Incandescent Arc Light company are: Samuel Insull, president; S. Bergmann, first vice-president; Martin J. Insull, second vice-president, and P. H. Klein, secretary and treasurer. Mr. Insull also stated that the Paragon motor interests had been bought and would be pushed in both the fan and small power fields. The Wright discount meter is owned by him and is to be manufactured in the General Incandescent Arc Light company's factory in New York city. A "G. I." incandescent lamp has just been put on the market, but Mr. Insull was reticent as to the details of its production.

The plans for placing goods on the market are similar to those which Mr. Insull inaugurated when building up the Edison General Electric company, and which have since been followed closely by the General Electric company. The General Incandescent Arc Light company will control its own distributing agencies as far as possible, and in the West the organization of the Martin J. Insull company to take over a large business already running in Chicago afforded further facilities. There will be representatives in Minneapolis and St. Paul, Milwaukee, St. Louis and other large cities. Influential affiliations have been offered everywhere.

In New York the parent company has its familiar down-town distributing agency in Cortlandt street. Mr. J. B. Cowan, who has been in the service of the Chicago Edison company, and who once was traveling representative for one of the big Scotch thread houses, has been appointed manager of the export department and of the New York sales office. Agencies will soon be opened in the larger eastern cities, and it is quite likely that a London branch will be established.

South African Trade.

[From the Washington correspondent of the Western Electrician.]

Our electrical trade with South Africa is increasing rapidly, and now that a line of steamers running at regular intervals is connecting the two countries, it can be safely predicted that there will be a still more marked increase in this trade in the future. The competition for the electrical supply of South Africa is, as might be expected, very keen. The demand, too, is large and rapidly expanding. It is evident, therefore, that our electrical manufacturers who are striving for the trade of this rapidly growing country should carefully study the situation and see that they are not outstripped by the country's vigorous growth.

The fact has been brought to light that Germany is America's greatest competitor for South African trade, and the aggressive tactics employed by German manufacturers may be studied with profit by the American exporter who desires to keep his finger on the pulse of the world's commerce. There was a time when German importations in many branches of trade practically held the South African field against all comers. The prejudice of that country was all in favor of things "made in Germany." But within the last year or two there has been a wonderful change with regard to importations from that country. It would appear that colonial merchants will not purchase German goods if they are able to procure them from the United States or England at the same price. Consequently, German trade has been materially checked, to the advantage of American shippers.

A glance at the shipping freight rates shows the great advantage American exporters have over those in England and Germany. The freight rates from the United States to Cape Town are as follows: First class, fine goods, \$8.50 per ton; second class, fine goods, \$6; third class, rough goods, \$5.46; fourth class, rough goods, \$4.25. The rates from Germany to Delagoa Bay are: First class, \$12.15; second class, \$9.72; third class, \$9.11; fourth class, \$8.50. The freight from England is: First class, \$13.36; second class, \$10.12; third class, \$8.50, and fourth class, \$7.78.

American manufacturers can obtain a larger share of the trade of South Africa by "hustling for it," as that expressive colloquialism is understood in the United States. A. F. T.

Southwestern Convention to Be Held in May.

E. L. Wells, Jr., the secretary of the Southwestern Gas, Electric and Street Railway association, announces that the date of the annual convention of the association, to be held in Austin, Texas, has been changed from April 19th to May 17th. The postponement was deemed advisable by the directory on account of the prevalence of smallpox in the Southwest, and especially in the republic of Mexico, and also on account of the inability of the Commercial Club of Austin to complete the convention and exposition building as soon as was expected.

Electrician, Spare That Tree!

Appropos of the old controversy over the effect of electric wires on the foliage and branches of shade trees, the New Orleans Times-Democrat gives publicity to a good story told by a man connected with an electrical company in that city. "Some time ago," he says, "a prominent citizen came raging into

our office and declared that a wire of ours had killed a pet tree on his premises. 'That tree has been standing there for twenty years,' he said, 'and we regarded it as one of the family. My children played under it when they were babies, and it's associated with some of the pleasantest memories of my life. When it began to die we all mourned, and we couldn't imagine what ailed it until yesterday, when I noticed that infernal wire lying right across a branch. My poor tree has been electrocuted, sir, and, by heavens, I feel as if murder had been done at my house.' I went out to view the scene of the assassination and found the tree still alive, but feeble. When I came to trace the wire I discovered one end nailed to the roof of an old barn and the other twisted around a discarded pole. It had been cut off for at least two years and forgotten. So I made the following report: 'Tree alive, wire dead. Wire evidently killed by tree. Bill inclosed.'"

Professor Bell Believes in "Wireless Telephony."

[Special correspondence of the Western Electrician.]

Detroit, April 10.—Professor A. G. Bell of telephone fame was at the Cadillac Hotel, this city, to-day, on his way to visit the school for the deaf and dumb at Lansing, Mich. When interviewed for the Western Electrician, Professor Bell said:

"I am very much interested in the experiments in wireless telegraphy recently made with success between Calais and Dover. The principle now seems established that the ratio of the distance the current will successfully operate is not in proportion to the height of the stub wires, on poles, but to the square of the height. Thus, if with poles 100 feet high you can send a current four miles, with 200-foot poles the current would go 16 miles.

"Do I believe in wireless telephony? Why not? I haven't any doubt but it will come, in the near future. And what a saving that would be! Our com-

Electrically Operated Paint Factory.

By ORRIN E. DUNLAP.

Among the manufacturing plants at Niagara Falls, that are using electric power for the operation of machinery is the Francis-Frost company, which manufactures weather and waterproof paint. The plant is in the northern part of the city, and to the people of Niagara Falls it affords an example of the efficiency of transmitted electrical power, and an indication to factory-site seekers that it is unnecessary to locate near either of the great power stations in order that they may operate successfully.

This is a feature encouraging to the future growth of the city in all directions, and many times it is found that these smaller factories employ more hands in proportion to the power used than many of the great electro-chemical plants now becoming so numerous in the Niagara locality. In fact, at Niagara Falls a Business Men's Commercial association has recently been organized to advance the interests of such plants and add to their number by offering special inducements to them.

In the Francis-Frost works several things are found which prove the convenience and safety of electrical power in a plant where there is inflammable material on all sides. The building occupied by this company was originally designed as a gas-house. It is built of brick, and in form is octagonal. It is located close to the river bank, over the Whirlpool Rapids, where both up and down the river the view is most delightful. While its exterior appearances belie the statement, the factory has five stories, three of which are above and two below the ground level. The mixing floor, a view of which is presented in Fig. 1, is at the top of the building, and there three mixers, each having a capacity of 100 gallons, are located. The next floor down is the mill floor (Fig. 2), where a 25 horse power electric motor, two 36-inch burr mills, one 30-inch burr mill and five steel mills are operated. Next below is the tank and stock floor (Fig. 3), where there is one 550-gallon

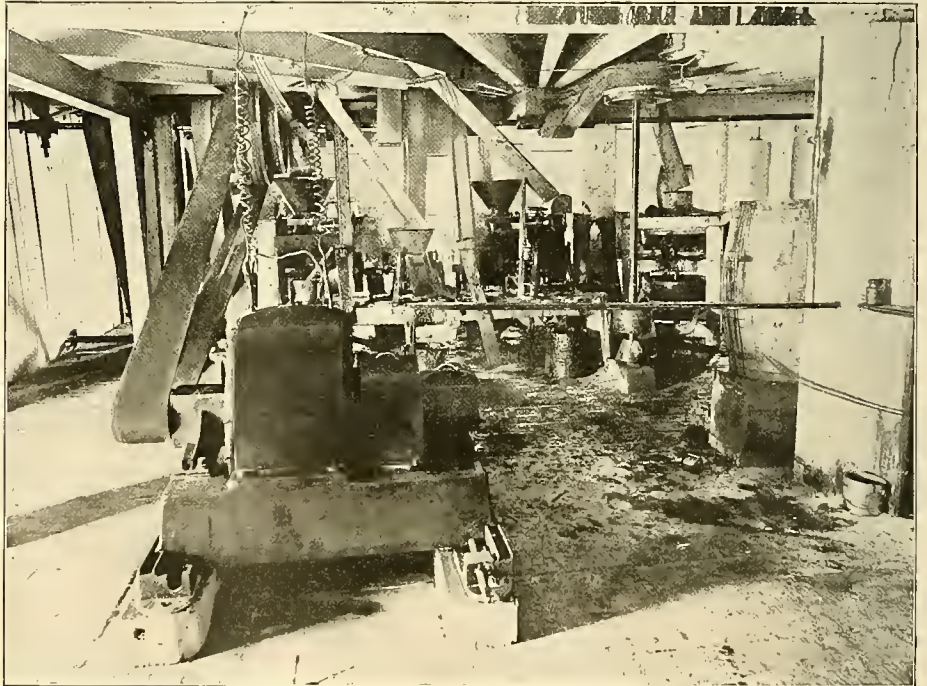


FIG. 2. ELECTRICALLY OPERATED PAINT FACTORY.—MILL FLOOR, SHOWING 25 HORSE POWER MOTOR DRIVING SHAFTING FOR PLANT.

pany already has enough wire out to reach 42½ times around the earth, and more is being strung every day. The telephone business will continue to increase until no man knows its limits.

"As to the future of electricity, I could not say. The science is not yet really developed. The latter end of the nineteenth century especially will be known as the age of electric marvels."

Professor Bell is at present very much interested, he says, in the X-ray. Asked if it had any bearing on the telephone, he said: "Not that I know of, at present; but experimenters are working all over the country, and there is no telling what they may bring forth."

Asked what he thought of the value of patents, as protection for inventors, Professor Bell said:

"No invention can really be made useful to mankind unless it is patented, for the simple reason that no capitalist will invest his money to bring out the invention, unless he has some security for his loan; and he will never make an advance unless he has a share in a patent. In this sense, at least, the government patent office does well in stimulating creative genius. I do not believe that any invention can really be made serviceable to mankind unless patented. I hold this view in spite of the fact that many eminent inventors in this country profess to distrust the security offered by a patent, declaring that they would prefer to keep their methods secret, or else sell out before competition filled the market." J. H. G.

tank and six 150-gallon tanks. The large tank is located about the center of the floor, and from it, over the other tanks, there runs a three-inch pipe, with valves leading into each of the smaller tanks. The two floors below this main floor are used as stock rooms, one for lead, zinc and oxides, and the other for oils, turpentine and dryers. The power for the operation of the plant is supplied by the Niagara Falls Hydraulic Power and Manufacturing company. The plant is lighted by incandescent lights and has an electric lift connecting all floors.

In the manufacture of the paint the raw materials are mixed on the top floor and run down through a pipe to the mills on the floor below, where the ingredients are ground. From this floor they pass into the 550-gallon tank on the ground floor, where they are mixed and thinned. From this they pass into the 150-gallon tanks, where they are shaded up, and then run into the cans and barrels for shipment. The company's output is about 1,000 gallons a day, and this is put up in packages holding from a half-pint to a barrel.

J. C. Frost is president of the company and T. J. Wilcox is secretary-treasurer. The superintendent is George Chittenden.

The Big Creek (Cal.) Power company has placed an order with the Westinghouse Electric and Manufacturing company for a complete outfit for the generating of 225 additional horse power at Big Creek.

Wehnelt's Interrupter Anticipated.

No sooner had the discovery of A. Wehnelt been given to the world than the announcement was made that it had been anticipated. Starting from the well-known fact that a current passing through a liquid between two electrodes of very unequal area is capable of producing luminosity on the smaller electrode, and that these luminous effects show signs of intermittence, Wehnelt sought to determine whether there was a true interruption of the current, or only a variation between a maximum and a minimum value. The accompanying diagram illustrates the method employed. On inserting a lead plate, b, and a platinum electrode, c, in a beaker, a, filled with dilute sulphuric acid, taking care to conduct the current to the wire through a tube, d, filled with mercury, to prevent spluttering, it was found that such a cell, with the wire as anode, acted as a very perfect interrupter of frequency about 1,000 per second, giving sparks over 40 centimeters long with six amperes and 12 volts. A condenser is superfluous, and there is no need to eliminate self-induction. The interruptions occur with remarkable regularity, as may be judged by the constant pitch of the tone emitted. One of the special applications in which the discovery is expected to be very useful is for purposes of wireless telegraphy.

J. Strachan calls attention in the London Electrical Review to the following extract from Gore's "Art of Electro-metallurgy," entitled "Electrolytic Vibration and Sounds."

As long ago as the year 1801 Gerlon observed that mercury exhibited peculiar movements whilst acting as an electrode in electrolysis, and this phenomenon has been since investigated by Sir J. Herschel, Sir H. Davy and others. According to G. Lippmann, the contraction of a globule of mercury (whilst acting as a cathode in dilute sulphuric acid), on the passage of the current, is due to a change in the capillary constant. (Journal of the Chemical Society, vol. xi. p. 1,094.) It was whilst investigating these peculiar movements and searching for thermic changes in electrolysis, by passing an electric current through a solution of double cyanide of mercury and potassium with mercury electrodes, that I first heard a faint sound, and then observed the surface of the mercury covered with waves; and by further research was led to the discovery of electrolytic sounds; the dancing motion and musical sound being due to the alternate formation and destruction of films upon the mercury by electrolytic action. A paper on the subject in the proceedings of the Royal Society, 1862, contains a full account of the phenomenon and the influence of various circumstances on it.

The best liquid for producing the sounds consists of ten grains of cyanide of mercury and 100 of pure hydrate of potash, dissolved in 2½ ounces of aqueous hydrocyanic acid, containing 5 per cent. of the anhydrous acid ("Scheele's strength"); the liquid should be filtered. The phenomena usually occur only at the negative electrode, and out of a large number of solutions examined, the only ones in which the phonetic vibrations occurred were those alkaline cyanides containing dissolved mercury. The quicksilver may be contained in two very small watch glasses submerged in the solution, and the current from either two Grove's or five Smees' cells, conveyed to the electrodes by platinum wires, protected, except at the ends, from contact with the liquid by means of tubes of glass or india-rubber. During the occurrence of the sounds the current itself is rendered imperfectly intermittent, and the arrangement may to a certain extent be employed for similar uses to those of a break-hammer.

Death of Prof. G. H. Wiedemann.

The death of Dr. Gustav Heinrich Wiedemann, professor of physics at the University of Leipzig, is reported. Professor Wiedemann was a scientist of eminence, and his name was known all over the world as the editor of the Annalen der Physik und Chemie, generally known as Wiedemann's Annalen. He was in his 73d year, and his scientific researches



Fig. 1. Mixing Floor.



Fig. 3. Tank and Stock Floor.

ELECTRICALLY OPERATED PAINT FACTORY.

began as far back as 1845, when he was a youth at Berlin University. He devoted his attention to physics and chemistry, and his electrical investigations and experiments were far-reaching and useful, as is shown by his writings. His most pretentious electrical work was "Die Lehre von der Elektrizität," published in five volumes in 1885. Since 1871 Dr. Wiedemann had held a professorship at the University of Leipzig.

Tammany and Municipal Ownership.

[From the New York Sun.]

The Tammany Hall general committee has obligingly passed a resolution imploring the Legislature to give the city the right to build and operate a gas plant for the purpose of lighting and heating itself. Municipal ownership of public franchises and declamations against corporations are a part of the official Tammany programme. The edifying attitude of Tammany in regard to corporations and franchises

has been impressed upon the community in the last few weeks. Corporations from which Tammany is excluded are necessarily evils to be abated. On the other hand, corporations which are leavened by Tammany are necessarily free from those evils and do not need to be interfered with.

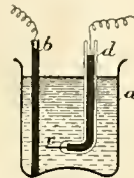
Municipal ownership, with Tammany to do the managing and multiply the offices, would undoubtedly be a dream and a delight. Expensive, but who will grudge expense when the money goes to an appreciative concern like Tammany? Municipal ownership may be expensive, but Tammany believes it to be good.

There is a beautiful business-like simplicity in this project, as in most other of Tammany's projects. It is ingenious, but it is great.

Electrical Machinery in England.

[London correspondence of American Trade.]

It is a pity that the Bureau of Statistics of the United States Treasury Department does not give more details of the export trade in American electrical manufactures, machinery, etc., instead of



WEHNELT'S ELECTROLYTIC INTERRUPTER.

merely lumping the various articles under the generic title of "instruments and apparatus for scientific purposes, including telegraph, telephone and other electric supplies;" while under another heading we simply have the particulars of electrical machinery shipped abroad under one total, it thus being impossible to tell how the trade is growing.

Apart, however, from official sources, there is every evidence that American electric-light plant and machinery is doing well in England. The sale of your electrical appliances in this country has risen in value from \$393,270 in 1896 to \$465,412 in 1897, and to \$692,500 in 1898; while the total value of your shipments of electrical machinery during the last six months of 1897 was \$661,581, and during the whole of 1898 \$2,512,920. It is certain that the trade is rapidly extending, particularly in Great Britain.

There can be but little doubt that the American manufacturer of electrical appliances stands pre-eminent to-day. This is particularly the case in the production of railway plants. While the continental makers have been content to theorize, the American electrical engineers have been busy in the domains of practical experiment and work. The demand for electric transportation has been much greater for suburban travel in the United States than in England, and this has furnished another incentive for practical rather than theoretical work by American manufacturers.

In addition to the transportation interests there

electric underground railroad, including rolling stock, power houses and electrical elevators, has been placed in the United States. The total amount of the contract comes to nearly \$12,000,000, although this will not all be for electrical equipment.

The development of this trade has aroused the attention of the technical journals here. The Electrical Review, in commenting on the fact that these contracts are being placed in the United States, says that the German and American manufacturers are quick to appreciate the wants of a community and will supply just what is wanted without inquiring whether it is a reasonable or foolish demand, and adds that English engineers should study the reason of the successes of the Americans. That seems rather tardy advice, considering the millions of dollars' worth of electrical plant now on order in the United States of America on British request. The Engineer, another leading London paper, says: "We are becoming more and more dependent upon American toolmakers. Within the last few months we have gone to the United States of America to get elevators for the Central railroad of London, and now we are forced to go to the American side of the Atlantic for electric motors with which to equip them. Until our manufacturers take the trouble to teach their hands how to provide new machinery we must continue to witness the humiliating spectacle of seeing our contracts awarded to Americans." It is hardly to be wondered at when English tenders for steel rails range from \$2.50 to \$7.50 per ton more than American and German bids.

There is a decided boom on just now in the matter of providing better and quicker transit in London and the principal British towns, and electric railroads are being constructed in the metropolis, Leeds, St. Helens, etc. I think it would be well for American manufacturers in this business wishing to compete to write to the city engineers, care of the local board, in each city. The leading industrial and trade cities are the centers which should be addressed first. The Central Underground Railroad company has just received some of the numerous electric locomotives ordered from United States makers.

Nor is it only in Britain that American railroad electric supplies find a ready sale; Germany has made great strides of late years in the manufacture of railroad material, but American apparatus finds a ready sale there; while in France, for example, nearly one-half of the 24 roads operating electrically are now using Thomson-Houston equipments.

As regards the future, experts here think that after a time Europe will possess equally efficient machinery with America, and it will then be only a question of raw material, and you have nothing to fear from Europe in this respect, your copper mines being inexhaustible, your iron, steel and coal almost limitless.

Mine Defense of Santiago.

The mine defense of Santiago harbor is the subject of an article prepared by Lieut. Capehart of the navy, who investigated the mine fields through which the Merrimac passed. He says that had proper care been taken of the electrical apparatus no fleet could have ever passed into the harbor. All mines examined were found clogged with marine growth to such an extent as to render them in many instances almost useless. Lieut. Capehart draws the following conclusions:

"Contact mines of the type encountered at Santiago and Caimanera are liable because of the growth of barnacles to become very much impaired as regards the operation of their different parts. This growth forms so rapidly in the warm water of the tropics that in a very short space of time it is sufficient to prevent the arms from driving the plungers in far enough to break the vial containing the sulphuric acid. They, therefore, require constant attention, and from observation it seems that to make them effective they should be raised and cleaned about every two weeks. The examples of the Texas and Marblehead in picking up on their screws mines of this description are sufficient to illustrate the harmless condition to which they may revert, no matter how good they may be when planted. The moral effect of a mined harbor is tremendous, and the question of risking valuable ships is of vital importance. What would have happened to a ship attempting to run the mine fields is problematical, but the chances are that she would have been sunk, for notwithstanding the number of bad mines encountered enough good ones were left to have destroyed her. The electrical mine was perfect in type and design, and had it been properly planted and cared for the protection given by it to the entrance would have been absolute. The lesson to be learned is evident: Mines cannot be planted hurriedly and carelessly allowed to remain without attention and then be expected to give theoretical results.

"It does not require much of an argument to convince us all that practical education in this particular branch of our profession is what the service needs. The details, at times so seemingly insignificant and unimportant, are just the trifles which make success or dismal failure. In a mine defense one cannot admit for an instant that there is a chance of a failure, for it must be so perfectly installed that it may be counted upon with perfect confidence. This is feasible and possible, and a course of training would, in a short time, make the members of our service masters of the important details, without which knowledge no assured success can be expected in either mine defense or countermine."

are three distinct lines of export: First, mining appliances, which include pumps, locomotives, hoists, blowers, etc.; second, appliances for the transmission of power; third, telephone and electric-light appliances. We have seen that your sales here of electrical appliances have doubled within three years, while the shipments under the other two heads must have been equally satisfactory.

The street railroad at Bradford is equipped with an American plant, the important Middlesborough and Stockton line is American throughout, the new railroad at Cork is to use American machinery, while the extension of the Leeds railways will be made with American materials. There is also an extensive lighting plant for the Metropolitan Supply company coming from an American house. I learn that one United States firm alone has a total of 262 electric-railway motors and generators now under construction for England, which is the best evidence that the American manufacturers are steadily gaining favor in Europe.

The complete equipment of the Central London



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DEPARTMENTS.

Table listing departmental contents with page numbers, including Correspondence, Electric Lighting, Publications, etc.

Mr. Asher's plan for operating wagon trains by electricity, outlined on another page, suggests many applications of electric power, but it is hardly possible that in the form proposed the scheme will ever be put in practice.

might be found in this scheme if the necessary permission could be obtained for stringing overhead trolley wires in roadways, and operating motor wagons along certain lines in a systematic manner.

Statistics have been prepared by the government showing that American exports of manufactured goods now average \$1,000,000 a day. There were 204 working days during the first eight months of the current fiscal year, and during that time the total exports were \$207,000,000.

An examination of the latest official utterances upon the Paris Exposition of 1900 discloses the fact that thus far no steps have been taken to amend the patent regulations so as to protect foreign exhibitors.

In Wiedemann's Annalen A. Sommerfeld has presented the results of interesting experiments upon the propagation of Hertzian waves along a wire and the particulars of his investigations in this interesting field.

The statement which was cabled from London last week and published in the Western Electrician, regarding the alleged telephoning without wires between Brussels and a suburban point, was probably the product of a fertile imagination, but it has served to direct attention to the possibilities in this field.

772,989 miles of wire, while the extra-territorial and toll lines now aggregate 385,911 miles and the long-distance system 123,275.05. It would be difficult to make a fairly correct estimate of the wire mileage of the numerous independent exchange and toll-line systems and private lines that have developed so rapidly since the expiration of the Bell patents.

In the meantime Marconi continues to improve his apparatus and show constant advancement in the art of telegraphing through space. It is now announced that he will attempt to establish communication, through his system, between Nice and Corsica, 110 miles apart.

American manufacturers of electrical apparatus receive encouraging reports from abroad concerning their products, especially from Great Britain, where it is being accepted in spite of the natural prejudice that exists there against everything made outside of the British possessions.

An analysis of the electrical exports from the United States shows a rapidly increasing trade with the British colonies, especially Canada, the Australasian colonies and South Africa, markets which the British manufacturer has hitherto held.

The United States consuls in Japan furnish highly complimentary reports upon the reception accorded American electrical machinery, and they also testify to the appreciation of the methods employed in this country.

Conflicting views are entertained in many states upon many points that have been raised in litigation over the duties, responsibilities and liabilities of telegraph companies. In many parts of the country it has become customary to send messages over the telephone to telegraph offices, where they are taken down by a representative of the telegraph company and transmitted as telegrams to more distant points.

Under such circumstances, therefore, the telegraph company is liable for a mistake on the part of the agent in the name of the person for whom the dispatch is intended, which prevents it from ever reaching him. Where an error of this kind led to the miscarriage of a telegram designed to inform the plaintiff of the death of his father, a verdict of \$200 against the Western Union Telegraph company was upheld on appeal.

Death of M. K. Bowen.

M. K. Bowen, president of the Chicago City Railway company, succumbed to an attack of appendicitis on Sunday evening, April 9th, after less than 48 hours' illness. Mr. Bowen had attended to his official duties to the last, and had left his office Friday evening after disposing of such business matters as required immediate attention, with the intention of taking a holiday. He had secured transportation to Colorado Springs, where he expected to recuperate his health, which had not been rugged for several years, and he appeared greatly relieved by the release from the exacting duties of his position, looking forward with the liveliest interest to his western trip. During Friday evening, however, he complained of severe pains, which he attributed to indigestion, and he applied some simple remedy, but without obtaining relief. During the night his suffering was so great that medical assistance was summoned. The physician recognized unmistakable symptoms of appendicitis in an advanced stage, and a consultation was held at midnight, when it was determined to remove the patient to the Chicago Hospital and perform an operation. Mr. Bowen readily consented, and the operation was performed Saturday morning at an early hour. It was then found that the disease had progressed too far to be checked, and although Mr. Bowen rallied after the operation and made a hard struggle, the physicians in attendance held out no encouragement.

Mr. Bowen's family were summoned to his bedside an hour before his death, when it was apparent that the end was fast approaching. Death relieved him of his sufferings at about nine o'clock on Sunday evening. Mr. Bowen's wife and two children, Allen B., aged 12 years, and Marian, aged four years, survive him. The funeral was held Wednesday and the remains were taken to Jackson, Tenn. The directors of the Chicago City Railway company met Monday afternoon at five o'clock and passed resolutions of condolence with Mr. Bowen's family.

Menard Kenner Bowen had won recognition and had gained the prominence he enjoyed in street-railway circles by ability, earnestness and well-directed effort. He was only 41 years of age at the time of his death and he had been head of the South Side system for several years, although he was elected to the presidency only in January, 1898. One year before, however, he had been made general manager, a position created for him by the board of directors as a reward for his valuable services as superintendent. He had been identified with the company five years at that time, and had been superintendent four years.

Mr. Bowen's early experience fitted him for the position he finally secured. He was born in Jefferson Barracks, Mo., the army post on the Mississippi River, 10 miles below St. Louis, in 1858. He was the son of General John S. Bowen, who was a graduate of West Point, and a grandson of Pierre Menard, the first lieutenant-governor of Illinois. He received his early education at the St. Louis University and later took a course in engineering at the Washington University in St. Louis. At the age of 19 Mr. Bowen went into the service of the United States government as assistant engineer on a triangulation survey of the Mississippi River. Later he was made assistant engineer of the jetty work in the harbor of New Orleans and the pass. In 1880 he became identified with the St. Louis and San Francisco railway and was given charge of the topographical survey from Fort Smith, Ark., through to California. He was engaged in this and similar work for several years, and then entered the street-railway field.

His career as a street-railway man began at the time the cable system was occupying public attention. His first important undertaking in this line was at Kansas City, where he became chief engineer and superintendent of construction of the Kansas City Railway company, which was then building its cable lines. He was so successful in this enterprise that when the road was completed he was retained as general superintendent of the system. The field proved too limited, and Mr. Bowen was induced to go to New York as the representative of the Short Electric Railway company. After a year's experience he decided to return to the operating branch of the business, and secured a position with the Chicago City Railway company as the assistant of Charles B. Holmes, then president and superintendent of the company. Mr. Bowen soon relieved Mr. Holmes of all responsibility in the operating department, and at the end of the first year he was given the title of superintendent. From that time he was an important factor in the management of the South Side system, and it may be said that he was absolutely in control of the operating department, and the extensions and improvements that were undertaken and completed during that time were of his planning and execution. He showed marked executive ability and a capacity for organization rarely combined in one individual. Under his direction methods of conducting the business of the company were revised, new lines were constructed, old roads extended and rebuilt, and the motive power changed from horse to electricity on all but the trunk lines, which were operated by cable. At the time Mr. Bowen assumed the duties of his position as superintendent there were no electric lines operated by the company. To-day all but the State street and Cottage Grove avenue lines are electrically operated.

In addition to his duties as superintendent Mr. Bowen introduced many improvements in the service which required entirely new apparatus, and made

extensive experiments which resulted in marked advancement in the construction department. He introduced the accepted methods of steam railroading as far as possible, and during his administration the shops of the company were greatly enlarged and improved and their efficiency raised. One of his first experiments was in cast-welding joints, and the early experience proved so satisfactory that the entire system has since been reconstructed along these lines. Another innovation in street-railway practice introduced by Mr. Bowen was the use of a dynagraph car, which is an ordinary car equipped for the purpose of determining and showing the condition of the track over which it passes. The result of this test enables the management to determine just how much money will be required to reconstruct the track and put it in first-class shape. Mr. Bowen described this device and the method of operation, and related the results which he had obtained through its use, in his paper on "Track and Track Joints," which he read before the American Street Railway association at the St. Louis meeting. This paper, which was printed in the Western Electrician, November 7, 1896, is still regarded as his most notable contribution to the literature of street-railway construction and operation. It attracted attention abroad as well as in this country, and provoked considerable discussion. Another subject which had long proved a problem in street-railway management was the proper heating of cars. Mr. Bowen designed the Columbia heater, which has been very extensively adopted for this class of work with satisfactory results.

A feature of Mr. Bowen's management was the establishment of departments for which the head was held responsible with corresponding recognition



MENARD KENNER BOWEN.

for whatever was accomplished. The men in charge of the several departments assemble every week for conference with the superintendent upon matters pertaining to the operation of the road. This plan has proved very satisfactory, and is now recognized as an established feature of the South Side system.

These are only a few of the many innovations introduced by Mr. Bowen. As a matter of fact, a complete record would require a detailed history of the period of his connection with the company, for he was ever studying the problem and constantly working to improve the system.

At the annual meeting of the directors of the company in January, 1897, Mr. Bowen's work was recognized and rewarded by promotion to the position of general manager, which had been created especially for him. His duties had been gradually increasing and his responsibilities growing, but as he proved competent in every emergency it was determined to give him a title that would be in keeping with the nature of his duties. As general manager he had absolute control of the company's business under the president and board of directors, and at the expiration of the first year he was elected president. He continued to hold this office to the time of his death.

Mr. Bowen was in many respects a remarkable man. He was resourceful and self-reliant, and he had the faculty of inspiring confidence in his ability among his associates and winning the most loyal service of his subordinates. He understood every detail of the system of which he was the head and he could run a car, direct the work in the blacksmith shop or the power house. His valuable experience in engineering work gave him an advantage and his familiarity with manufacturing enterprises also aided him greatly in his work. This extensive knowledge and practical experience likewise made him appreciate the work of those engaged in the operation of the system.

Mr. Bowen was a member of the Union League Club of Chicago and the Masonic fraternity. He was also greatly interested in the American Street Railway association, and was chairman of the general committee having in charge the arrangements for the meeting and exhibition to be held in this city in October.

Cost of Public Lighting.

(Special correspondence of the Western Electrician.)

Detroit, April 5.—Commissioner Ingram of the Detroit Public Lighting Commission read a sensational report last night, at a session of the Board of Control, asking that the working staff be cut down 30 per cent. and that other radical changes in management be made. In part, Mr. Ingram said:

We are spending too much money, and in order to make a good showing in operating expense we are charging to investment account what properly belong to expense account. We must curtail our expenses. Our investment on our track is now \$99,000. Does anyone imagine we have \$200,000 worth of property to show for it? Our fixed charge, per lamp, is now \$12 and is increasing rapidly. During the past few years we added to our investment account the sum of \$160,000. On a basis of average equivalent, this adds to the cost of an arc lamp \$4.10 per year. At this rate our fixed charges will soon equal our operating expenses, and in two and a half years our investment upon which we must pay interest, etc., will be \$1,000,000.

Mr. Ingram's comparisons of the cost of arc lighting showed that Detroit's account was higher than that of any city in the country, whose reports were accessible, except Chicago. He said:

Our lights are costing vastly more than appears from the printed report. It is our practice to charge up the cost of excessive maintenance to the cost of maintenance that has wrought the mischief. By thus reducing the pro rata fixed charge per light, the actual cost has been made to appear low in the eyes of the public.

Mr. Ingram also claimed that purchases had not been made in a business-like way. For instance, he said, the executive officers had recommended that three Westinghouse engines and dynamos be thrown aside and new ones of another make installed, costing three or four times as much, on the plea that the new machines would occupy less room, when, as a matter of fact, they would not effect any saving whatever. The net gain from the change would be but 1,200 incandescent lights, which, he declared, at present the city does not need, as the old machines have a capacity of 3,600, and the heaviest load this year has been only 1,800, one-half the actual capacity.

Commenting on some of the investments of public money, the commissioner said:

For the six months ended December 31, 1898, we received as rental for our poles only \$86.89. Our investment for conduits alone is \$34,000. We have authority to compel private companies to use them and pay us for it. Our investment in poles, pipes and towers is \$227,000. We have 394 miles of wire strung on lines and towers; 5,210 of these belong to us, 923 to the police and fire department and the balance to private companies. There are 5,756 contacts with our poles by outside parties, and for all this we receive a beggarly rental of \$86.89, less the rental received for the \$34,000 invested in conduits. Our excessive maintenance and repair cost is caused by a superfluity of bosses, superintendents and assistants; I therefore recommend that the force be cut down 30 per cent.

Continuing, Mr. Ingram showed that the actual cost of the city's arc lights is now \$109.50 each per year. The report created a stir in electric-light circles. It was filed for action next Tuesday night. As the other commissioners are hostile to Mr. Ingram's charges, sensational results are looked for in the management of the Detroit electric-light plant.

The estimates submitted by the commissioners of the public lighting plant for the ensuing year amount to \$163,455. They have not yet been allowed.

Dawson's Telegraph System.

Upon authority of the United States consul at Clifton, Ont., it is announced that the Canadian government has decided to construct a telegraph line to connect the Yukon territory with British Columbia, and that a party of engineers has already been sent north to commence the work without delay.

The plan of the minister of public works is to construct the line of telegraphs between Lake Bennett and Dawson City at once. At the same time surveyors will examine the country northward from Quesnelle, British Columbia, which is the terminus of the present government system, known as the old Cariboo line, in order to connect with the line to Dawson.

The ministers have decided that the franchise for the telegraph line to Dawson is too valuable and too important from the standpoint of the national safety to be entrusted in other than government hands, and, accordingly, the enterprise will be conducted and controlled entirely by the Dominion government.

Electrical Machinery in Japan.

The United States consul at Osaka says that the manufacturers of electrical apparatus in the United States control the Japanese market.

"Electrical engines are imported from the United States, and they are giving general satisfaction. Telegraphic machinery was imported into Japan during 1897 as follows:

United States.....	\$2,301
Great Britain.....	1,102
Germany.....	691

"But little came from any other country. The Japanese government owns both the telegraph and telephone service.

"It is said that considerable delay has frequently occurred in the execution of orders from Japan for electrical machinery in Europe, and that, in consequence, the American market has been given the preference, with the result that the superiority of such machinery has been fully established. The more direct communication between the United States and Japan, together with the lowering of overland freights, should stimulate manufacturers of machinery to increased effort for this market."

DEVELOPMENT OF THE TELEPHONE FIELD.

Old-time Telephoning.

By AN OLD-TIMER.

Twenty years ago telephony was far different in every respect from the art to-day. A solicitor in those days had almost to go on his knees to make his arguments, and was told 99 times in 100, "Why, I can jump into my buggy and drive to the person I want to talk to and back before I could get him by telephone," which was too often true, for there was no multiple switchboard then, and the American district telegraph system was one in which the call was made over an American district telegraph instrument, a ticket was made, and in due time (often too long due) the call got through and the persons got together. But in the meantime the person calling, tired of waiting, had called again and again, all the tickets for which were consecutively answered, with the result of an unpleasant remark, such as "Oh! quit bothering me. I had 379 long ago and got through with him. Don't call me up again, please," with much emphasis on the last word, which gave the listener a choice of meanings between polite and profane.

The first exchange in Chicago opened with only 11 stations, from most if not all of which there was very little income, save a prospective one which might accrue from the advertising. These 11 "patrons" were bankers, I think, every one of them, and it was suggested that some plan of grouping all subscribers of one class together might relieve the pressure on the exchange which almost immediately developed when the system commenced to grow. This was an idea of General Stager, and in reply to a complaint of one of the patrons when the exchange had grown to a list of 500 or 600 subscribers, he said: "We have a solution of the trouble at last. We are going to group all the banks, the railroads, the different kinds of merchants together and so"—

"That's just what we don't want," came back the impatient answer. "I want everybody else but those in the same business I am in;" and the general's doll lost its sawdust.

There was a universal complaint by mail, by messenger, by telephone, of being "cut off," and these correspondents were not always more polite than prolific, while their remarks were often seasoned with verbal dressings and other condiments which are inadmissible in print. The matter became so serious that instructions were given to the electrician of the system to "sit down behind the switchboard and watch until the guilty party is detected, if it takes a month."

He watched and caught the mischief-maker in one short session. It was the plugs used for connecting lines on the board. These were made up in pairs on flexible cords. The handle of the plug was screwed onto the metal tip. When these were inserted in the board a twist was given to insure a firm contact. The switchmen used either hand indiscriminately, and the insertion of a left-handed plug almost invariably unscrewed the handle from the contact-plug. This broke the circuit, cut off the subscriber and left him to the indulgence of peppery remarks, which were not heard by the operator to whom they alluded. The connections were made solid before dark that day, and the mails for several days brought congratulations in abundance to the management, quite often accompanied by the request that now that the young devil was caught he would be made an example of, or words to that effect.

The exchange grew, and with it the difficulties increased in a rapid progression. With 500 lines it was seen that the addition of one subscriber meant a possibility of 500 more calls, and the next line increased this possibility by 501, so that what in ordinary business would naturally result in cheaper rates meant in telephony that wholesaling was more expensive than retailing.

It soon became evident that one board would not have room to permit of the necessary number of operators to do the work. So a second board, a duplicate of the first, was set up, into which dummy plugs were to be placed and removed as numbers were called or rung off. This plan was a failure. Plugs did not always get into the dummy, and were often allowed to remain after connections were broken.

Electricians all over the country, not only practical but theoretical scientists, pronounced the idea of connecting a number of duplicated boards together, so that operators could work independently without interference with any line which might have a connection on any other board—a mechanical and electrical impossibility.

The difficulty was solved by an invention in which the wire of any subscriber was carried to board one, two, three, etc., and then turned back through a brass contact piece at each board, ending where it commenced. This addition of the loop permitted any operator to "try" a line without breaking in on a subscriber, and thus knowing whether the line was engaged. This invention, for which a joint patent was issued to C. C. Haskins and C. H. Wilson, solved the difficulty, and was at once invaded by several parties. The patent held, however, and ran its course, having become the property virtually of the Bell company.

The Bell company (which was the competitor of the American District Telegraph company and owns it to-day) and the American District Telegraph com-

pany each covered so much ground that in order to have perfect communication by telephone it was convenient, if not necessary, that the large business houses should be patrons of both systems. As one of these systems did its calling by magnets and the other by battery and key, it became a problem how to call up both parties simultaneously. Finally a key was devised having a long, sweeping contact with the magneto-circuit, ending with a battery contact as the key came down. This answered the purpose and did good service.

Competition was close and earnest. It was the policy of a solicitor to ask a promise that, "If you don't take our system now, you won't take the other without letting me know first." Sometimes it was given thus: "Well, if the opposition cannot give me a line by a certain hour I'll take yours."

On one occasion a promise of that kind was made, and the prospective patron rushed to the opposition office, followed slyly by the solicitor, and told his story. "If you can put a line into my office by 6 o'clock, I'll sign an application for a line; otherwise the other party gets the application." The time was short, but the superintendent of construction was equal to the task. He was called up and asked if he could accomplish the feat. "Wait a minute," was his answer, and almost immediately came back, "Yes, sir, by 5 o'clock." The contract was signed; the line was in by 4:30, but the party next door complained next morning that his telephone wouldn't work. It was not to be wondered at, for the new man was using his wire, and the second line was run for the old subscriber!

A thoroughly disheartened subscriber came into the American district telegraph office one day, and said regretfully that it was no use, he must give up the telephone, as folks could not make him hear anything they said to him. The representative of the company called up his office, and asked him to try the line, at the same time noting that he held the receiver in his right hand. Turning to a messenger boy the electrician said: "Go to Ed Kelly and tell him I want a left-handed telephone," and as the boy hesitated, he hurried him with a gentle push, and silenced any remark he might be tempted to make. Kelly, who had rare capacity for appreciating a joke, poked leisurely over a pile of receivers, crooning a little song, and finally picked out one, which he handed the boy with, "Tell him we are nearly out of left-hand receivers, and there is only one left after this."

The ruse worked. The receivers were exchanged, the patron heard well with his left ear, and was astonished when he learned that he was deaf on one side.

A receiver in the office of a German gentleman, who had been hardly convinced of his need of a telephone, worked quite unsatisfactorily for some cause, and an expert was sent for to "either make the instrument work satisfactorily or take the thing out." The trouble was found, but it was deemed best to charge the receiver with the fault. The inspector examined the receiver carefully, and muttered some words about someone having disobeyed instructions, sending an instrument not intended for German use, which would have to be changed, all of which was accidentally overheard by the patron. It took 24 hours to get a German telephone from Milwaukee. This worked admirably, and the gentleman laughs to this day over the little trick which won him over.

A different experience was that of a well-known and well-educated Hebrew gentleman, who subscribed for an instrument in the store and one in his residence on the South Side. When the lines were completed an inspector, as they are called now, went over to instruct the subscriber how to use the telephone. The wife had been fully instructed in the meantime. When the connections had been made, the old gentleman opened the conversation in German. Then he tried Hebrew. French followed, and finally English. When all this had been accomplished satisfactorily, he rose from his seat, shook hands with the expert, and said: "It is most astonishing. It speaks all languages perfectly. Send around your bill," and the bill was paid on presentation without any intimation that "a little off would be appreciated."

Michigan Bell Activity.

[From the Detroit correspondent of the Western Electrician.]

The Michigan Bell Telephone company made a net gain of 1,326 subscribers in Michigan for the month of March.

Manager Land of the Michigan Bell Telephone company has opened a sub-station at 170 Griswold street. A handsome gilded sign on the window shows the 772 points in the state of Michigan which can be reached by the company's lines.

P. G. Reynolds, superintendent of construction of the Michigan Bell Telephone company, has established a linemen's hotel at 198 Lafayette avenue. It is really a boarding-house for the linemen of the company. Accommodations are provided for 25 linemen, including good board and clean cots, practically the same kind of life as is accorded them in camp. Mr. Reynolds thinks this is a more economical plan for the men than to have them hunt their own boarding-houses.

Telephone News from the Northwest.

[From the Minneapolis correspondent of the Western Electrician.]

The telephone line between Audubon, Ia., and Kimballton is being extended to Harlan, Ia.

The Merchants' telephone company is being formed at Melrose, Minn., with a view to putting in a local exchange and building a toll-line to Meire Grove. Other lines will be built as rapidly as possible.

The officials of Polk County, Ia., at Des Moines, have concluded to assess the telephone and telegraph companies doing business there, under a recent ruling of the county attorney. They have not paid county and city taxes heretofore except on real estate. The Iowa Telephone company's property is placed at about \$80,000. The Mutual Telephone company will probably amount to the same. The latter will decline to pay the tax, holding the tax collected by the state treasurer is sufficient.

A bill to regulate telephone charges, and another to permit telephone companies to use public highways for poles and wires, so long as they do not interfere with safety and travel, have been introduced in the Minnesota Legislature. The former makes \$3 a maximum rate for single instruments and \$2.50 for party lines. The second bill prohibits companies from maintaining poles in a city, village or town until they have a franchise.

The Knoxville Telephone company of Knoxville, Ia., is planning a toll-line to Pella, Ia. It will probably strike Flagler, Durham, Harvey and Tracy, and will eventually reach Oskaloosa.

The Northeastern Telephone company of Rush City, Minn., proposes to extend its toll lines from Mora, Minn., to Aitkin this summer. Herman Moorik has been granted a franchise for a local exchange in Aitkin also.

Well-deserved promotions have been made in the cases of C. P. Wainman and J. W. Christie of the Northwestern Telephone Exchange company. The former has been general superintendent of Minnesota, North and South Dakota and becomes general manager, succeeding J. P. McKinstry, promoted to vice-presidency. Mr. Wainman is succeeded by Mr. Christie, heretofore superintendent of the Minneapolis system.

The Mississippi Valley Telephone company is preparing to install a few instruments in Minneapolis soon, in answer to the demand of a number of patrons in the Guaranty building. The system will hardly be in shape for operation for several months yet.

The Duluth Telephone company of Duluth, Minn., is offering one-way service at \$1 per month.

A local telephone company was voted a franchise at Northwood, Ia., at the late election. The Iowa Telephone company has a system there, but the new organization will start with 100 subscribers.

A number of farmers in Mamre Township, near Kerkhoven, Minn., have formed a telephone company and will put up a line between Kerkhoven, Minn., and East Salem in the spring.

The Rocky Mountain Bell Telephone company will probably erect a modern building for its exchange at Missoula, Mont., this summer.

The Minnesota Central Telephone company is working to extend its wires to Morris, Minn., and thence to Sauk Center. The company is also preparing to change its entire system to a metallic circuit.

C. F. Greening of Grand Meadow, Minn., proposes to make a number of changes and improvements to the exchange there. A toll line will be built to Racine.

Farmers on the Illinois side of the river between Eliza and Muscatine, Ia., are building a telephone to connect with Muscatine.

The Fort Dodge (Ia.) Telephone company is an applicant for a franchise at Humboldt, Ia. The Iowa Telephone company will renew its request also.

The Iowa County Mutual Telephone company is about to construct a line from Marengo, Ia., to Ladora, thence to Genoa Bluffs, about 18 miles.

R. H. Evans has begun work on the new telephone system at Duluth, Minn., in accordance with the terms of the franchise. The new company proposes to put all wires in the business districts underground at the start. The Duluth Telephone company is manifesting considerable activity. It is claimed that it is putting in extensions under the guise of substituting copper-metallic for iron circuits.

The Oshkosh Northwestern Telephone company of Oshkosh, Wis., contemplates moving its exchange to new quarters, where it will have more room, by June 1st.

The Northwestern Telephone Exchange company is experimenting with a telegraph auxiliary in North Dakota. If a long-distance wire is busy, the station wanted by a newcomer will be called by telegraph and much time saved, as the new connection can be made instantly and the person wanted be at hand when the first talker is through. Winnipeg (Man.) business men have been consulting with the company in Grand Forks, N. D., with a view to having the system extended to Winnipeg.

The Otumwa Long Distance Telephone company has been granted a franchise in Otumwa, Ia. The company has its system in operation, but had never been formally authorized by the people to do business.

The Mutual Telephone company of Des Moines, Ia., has been granted a franchise for an exchange at Pella, Ia., and will proceed to install it as soon as possible. The company has also been granted a franchise at Monroe, Ia. Valley Junction will vote on granting the company a franchise April 27th.

The Citizens' Telephone company of Mankato, Minn., has let the contract to Jones & Winters of St. Paul to put in 430 feet of lead cable.

The American Telephone and Telegraph company will open an office in Superior, Wis., and begin work on a toll line to the Twin Cities at once. It is expected to have connection with the larger cities of the country by May 15th.

The Wisconsin Telephone company at Neenah, Wis., is changing the system from a ground-wire to copper-metallic return-circuit system.

The Northwestern Telephone Exchange company has been granted franchises in McIntosh and Red Lake Falls, Minn.

The Blue Earth Valley Telephone company offers to establish an exchange in Amboy, Minn., if sufficient subscribers can be secured.

The Sterling-Amboy Telephone company has been formed at Sterling Center, Minn., to build a line to Amboy.

The Northwestern Telephone Exchange company is considering erecting numerous suburban circuits from local exchanges into the country, extending a distance of 10 miles or less in different directions, for the benefit of the farmers.

The Wisconsin Valley Telephone company is preparing to establish a local exchange at Mondovi, Wis., at once. It will also extend toll lines to La Crosse and Minneapolis.

The Sauk Center (Minn.) Telephone company has secured about 100 subscribers for the new exchange.

A number of improvements and additions are being made to the telephone exchange in Wadena, Minn.

Cloid H. Smith has been granted a franchise for a local telephone system at Odebolt, Ia. He offers all-night service if he secures 75 subscribers.

C. E. Odel of Reinbeck, Ia., has gone to Iowa Falls, Ia., where he proposes to establish a telephone exchange.

A deal is under way for the purchase of the telephone exchange at Clear Lake, Ia., where a number of improvements are projected.

The Minnesota Mutual Telephone company has completed arrangements to extend its wires to Sandstone, Minn.

E. Hewett and Hans Swanson contemplate putting in a local telephone exchange at Warren, Minn.

The Southwestern Minnesota Telephone company is reconstructing its system in Pipestone, Minn. A 150-drop switchboard is being put in, and other improvements are under way.

An ordinance granting a franchise to the American Telephone and Telegraph company has been introduced in the Board of Aldermen of St. Paul. Business men are urging the council to pass it in order that the city may have long-distance connections.

An expert has reported on the condition of the police telephone system in St. Paul. He finds that it is simply worn out. It has been in use 13 years, and the parts are all worn so that it is unreliable.

The Western Stearns County Telephone company has been formed in New Paynesville, Minn., to connect that village with the smaller towns of the county. Dr. P. C. Pilon is the prime mover of the enterprise.

The Fairmont (Minn.) Telephone company will extend wires to Armstrong, Ia., as soon as weather will permit.

The Perry Telephone company has been granted a franchise for an exchange at Adair, Ia.

The Minnesota Mutual Telephone company will extend its wires to Herman, Minn., and probably to Breckenridge.

A local telephone exchange is projected at Brodhead, Wis.

MANUFACTURERS AND DEALERS.

Perhaps no concern engaged in the manufacture of woodwork for telephone and electrical purposes has a better reputation than that of E. J. Noblett of Chicago. Mr. Noblett has for years done business with the largest telephone companies in the country, among them the Chicago Telephone company and the Central Union Telephone company. Mr. Noblett has a reputation for making only first-class articles, and those in need of reliable woodwork may find it advantageous to communicate with him.

The Western Telephone Construction company of Chicago has just placed an order with the American Hardwood Manufacturing company of Grottoes, Va., for 12 carloads of telephone boxes, each car containing more than 1,000 complete sets of backboards, battery and magneto boxes. In addition to this order it has contracted with the Grottoes company for a large quantity of special telephone desk cabinets, switchboard cabinets and other woodwork. The American Hardwood Manufacturing company has been making a specialty of telephone woodwork for four or five years, supplying the largest manufacturers of telephones in the country with woodwork.

A telephone system is being organized at Waynesville, N. C.

Canadian Telephone Service.

At the annual meeting of the Canadian Bell Telephone company in Montreal some interesting statistics were presented in the directors' report, from which the following items are selected:

During the year 1,637 subscribers were added, the total number of sets of instruments now earning rental being 32,082. The company now owns and operates 343 exchanges and 340 agencies. The company added 666 miles of wire to the long-distance system in 1898; 326 miles are in the Ontario department and 340 miles in the eastern department. The long-distance lines now owned and operated by the company comprise 17,233 miles of wire on 6,096 miles of poles. The receipts for 1898 were \$1,302,994.04, made up as follows: Exchanges, \$935,703.52; long-distance lines, \$264,455.49; private lines, \$12,743.32; miscellaneous, \$90,041.71. The expenses were \$971,792.30, divided as below: Operating, \$897,138.73; legal, \$9,582.22; insurance, \$13,740.20; bond interest, \$47,042.16; miscellaneous, \$4,288.99. The net revenue was \$331,151.74.

John L. Bittinger, the United States consul-general at Montreal, has prepared a report on "Telephone Service in Canada," dated March 15th, which contains the following information:

The Bell Telephone company, Limited, covers the provinces of Ontario, Quebec and Manitoba, in the Dominion of Canada. The cost for telephone service in the city of Montreal is \$30 for private residences and \$50 for business houses per year. There is no cost for installation and rent. The cost at pay-stations in the city is 10 cents for five minutes.

The telephone is first located by the company where the subscriber directs; if afterward the instrument is required to be moved, the change is made by the company at the expense of the subscriber.

The Bell Telephone company has a long-distance service in the provinces of Ontario and Quebec, covering hundreds of stations. The charges for this service for written messages of 20 words or under are as follows: Up to 15 miles, 15 cents; 15 to 25 miles, 25 cents; 25 to 225 miles, 50 cents. Charge for delivery is extra, and for each additional twenty words, or fraction thereof, one-half the tariff is asked.

The province of Nova Scotia is covered by the Nova Scotia Telephone company; New Brunswick, by the New Brunswick Telephone company; Prince Edward Island, by the Prince Edward Island company; Newfoundland, by the Anglo-American Telegraph company. The city of Vancouver, British Columbia, is covered by the New Westminster and Burrard Inlet Telephone company. Victoria is covered by the Victoria and Esquimalt Telephone company.

Independent Toll-line System.

The negotiations entered into a few weeks ago between the United States Telephone company of Ohio and the National Telephone and Telegraph company of Indiana have been completed. The National company controls long-distance wires all over Northern Indiana and Ohio and Southern Michigan, and the United States company is rapidly extending its lines throughout Ohio.

The following-named officers were elected at the annual meeting of the National company last month: President, George W. Beers of Fort Wayne; vice-president, C. H. Cory of Lima, Ohio; secretary, D. J. Cable of Lima, Ohio; treasurer, W. H. Duffield of Lima, Ohio; directors, C. H. Cory, D. J. Cable, W. H. Duffield, W. L. Parmenter, F. W. Holmes of Lima, and G. W. Beers, Henry C. Paul and Samuel M. Foster of Fort Wayne.

The president's report showed that the mileage of the lines had been increased 20 per cent. during the year. The number of telephones in use at exchanges is 15 per cent. greater, the number of towns or toll stations connected with the system is 40 per cent. greater, and the net earnings of the company exceed those of last year by a little more than 100 per cent.

The question of uniting with the United States Telephone company of Ohio was taken up. The Ohio people were represented by James B. Hogue, secretary, and H. D. Critchfield, general counsel, of Cleveland. The deal commenced for a union of lines was concluded. By this agreement the whole of the Ohio company's lines are opened to the patrons of the National company. The connection with the Michigan lines will be made at Sturgis, and within 60 days a junction will be formed in the new exchange now building at Anderson, in which President Beers holds a controlling interest, with the lines of the New Long-distance company at Indianapolis, thus making the lines of the National company the connecting line for all the independent telephone users in Indiana, Michigan and Ohio.

EXTENSIONS AND IMPROVEMENTS.

Word comes from Tucson, Ariz., that "Edwin Treadwell is about to complete a telephone line from Prescott to Jerome, Ariz., a distance of 26 miles. The backer of the enterprise is his father, the professor."

"We challenge the world to beat it," is the proud boast of Otto Wettstein, Jr., of the La Porte City, Ia., telephone exchange. Mr. Wettstein's challenge was received on a directory of his new exchange. It contained the names and addresses of 120 "paying subscribers" in a town of 1,400—certainly an excellent showing.

TELEPHONY ABROAD.

The Dover Council is inviting other English boroughs to co-operate in securing a reduction of the limit of towns to which telephone licenses may be granted to below 50,000 population.

The Telephone and Switchboard Syndicate, Limited, London, was registered on March 17th, with a capital of £10,000 in £10 shares, to carry on business as financiers, company promoters, underwriters, concessionaires, contractors for public and other works, capitalists or merchants.

By direction of the postoffice authorities in Berlin, automatic telephones are to be placed in all their offices, railway stations and many other places. They will be on the penny-in-the-slot principle, and for the small sum of a penny the necessary number of minutes allowed for a brief conversation may be obtained.

The International Telephone Manufacturing company, Limited, was registered at London on March 1st, with a capital of £200,000 in £1 shares, to manufacture telephones and telephone appliances, to establish, work, manage, control and regulate telephone exchanges and electric-light works and to carry on the business of a telephone, telegraph and electric-light, heat and power company.

In the House of Commons recently the question was asked the secretary of the treasury whether the government received 10 per cent. commission from the National Telephone company, or from any other private telephone company, and whether it was on account of this arrangement that the government refused to take over and make the telephone a public service. Mr. Hanbury replied that the present licenses paid—as future licensees would pay—a royalty of 10 per cent. The answer to the second paragraph was in the negative.

At the Court of Common Council, London, when the Guildhall resolutions were brought forward, it was stated that the decision of the government as announced by Mr. Hanbury would largely affect these resolutions. Mr. Morton said that the thanks of the people of London, indeed of the United Kingdom, were due to the government for the steps it was to take. The Bristol Stock Exchange, however, is protesting against the government telephone measure as explained by Mr. Hanbury. It regards the proposals as an unwarranted attack upon the interests of capital.

The Bristol Chamber of Commerce has passed a resolution regarding the government telephone proposals to the effect that they are unsatisfactory upon the following grounds: "(1) That the proposals do not meet the requirements of commerce, and are calculated to prove highly detrimental thereto; (2) that they would result in a multiplicity of systems organized by local authorities, which probably would be found afterward difficult to unite; (3) that the working in detail of the telephones would be vexatious; and (4) that the council of this chamber regrets that apparently no weight was attached to the recommendations made to the government by numerous public bodies to the effect that one central authority was necessary for the satisfactory working of the telephones of the country."

The London Standard believes that it is probable that the provision in the telephone bill which only allows boroughs of 50,000 and upward to set up their own telephone systems will be dropped, as the general feeling is that any borough which is able to fulfill the necessary conditions should be allowed to establish a telephone exchange within its own boundaries. At Tunbridge Wells the corporation telephone committee considers that this, if adopted, will work against a proper development of the telephone system throughout the country, and it believes that it would be best that any town council, even if representing less than 50,000 residents, should have the same local telephone chances as the larger cities. Therefore, the committee advises the council to apply forthwith for a license to work a municipal system of telephones within the area now served by the National Telephone company, including Tunbridge Wells, Tonbridge and Southborough.

The committee appointed by the council of the Institution of Electrical Engineers of England to consider and report on the future of electrical engineering in the branch of telephony has made a careful investigation of the conditions, and, as a result, it is announced that the council has adopted the following report, submitted by the committee: "That, in the opinion of this committee, it is undesirable, from the point of view of the progress of electrical engineering, for the purely local telephone industry throughout the country to be held as a monopoly, or that legislation on the future of telephony in these kingdoms should discourage the undertaking of exchange systems within telephone areas by independent enterprise. The committee is therefore of opinion that the council should strongly urge on the government that such legislation may have the further effect of removing existing disabilities to the carrying out of the recommendation." It is also announced that copy of this report has been forwarded to the government.

Irving Hale's Career.

Brig.-Gen. Irving Hale, United States Volunteers, whose name has been so honorably mentioned of late as the commander of one of General MacArthur's victorious brigades, is a soldier of thorough and scientific training. He was born in the state of New York, and when a child went with his parents to Colorado. When about 18 young Hale secured an appointment as cadet at the United States Military Academy, and reported at West Point in June, 1880. He aspired to the distinction of establishing a record in class-standing, and in June, 1884, when the class was graduated, Hale's intention to be number one had been fulfilled, as had also his desire to reach the highest standing ever made in the history of the academy. He had gathered to himself class rank number one in all branches but two, and in these had pushed his sole competitor so hard that there was only the fraction of one per cent. between them.

With the academy officers he was respected and trusted, and was in turn corporal, first sergeant and captain in the cadet battalion.

The academy class graduated in June, 1884, furnished the almost unprecedented number of seven second-lieutenants to the Corps of Engineers, at the head of which number was Hale. He was assigned to station at Willets Point for the course in the torpedo school, and while there he became acquainted with a daughter of the commandant of the school, General King, whom he afterward married. He was later detailed as instructor in the department of engineering at the military academy and served for some time in this capacity.

A few years after graduation Hale resigned from the army and settled in Denver, where he became identified with the General Electric company. In Denver he became interested in the Colorado National Guard. He was able to give the organization the benefit of his military knowledge and scientific training, and was rewarded by rapid advancement. When the war with Spain began he was the brigadier-general of the state forces, and in supplying Colorado's quota of volunteers Hale was commissioned colonel, the highest place within the appointing power of the governor.

General Hale's part in the Manila campaign is well known. He was promoted brigadier-general of volunteers for gallant and meritorious services in the short campaign which resulted in the capture of Manila. In operations since that time he has been frequently mentioned for his energy and activity, and in the fighting of the last two weeks he has been conspicuously in the thick of it.

New Device for Igniting Welsbach Lights in Series.

The reduction in price of Welsbach lights has greatly increased the demand by those limited to gas as an illuminating agent, not only on account of the greater economy in consumption over the old style of burners, but in the vastly increased candle power per foot of gas. The difficulty of igniting



Fig. 1.
NEW DEVICE FOR IGNITING WELSBACH LIGHTS IN SERIES.

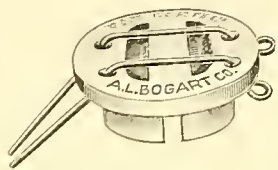


Fig. 2.

these lamps in elevated fixtures limited their use until the old forms of electric gas-lighting apparatus were modified so as to be applicable.

In lighting a number of these lamps in series, by coil or frictional machine, the peculiar enclosed form of the light, the chimney and delicate mantle presented conditions of considerable embarrassment in the attachment of the spark electrodes, as not only had ample insulation to be provided in a narrow and contracted space in the lamp parts, as turned out by the manufacturers, but, at the same time, the mantle must not be endangered.

The A. L. Bogart company of 123 Liberty street, New York, which has for a long time made a specialty of electric-igniting attachments for this class of lamps, has lately put on the market the simple and convenient device for series spark-lighting illustrated in Fig. 1, which is particularly adapted for use with Welsbachs with mica chimneys. The two electrodes are rigidly attached to a porcelain holder,

provided with a slot in its base, which embraces the top of the mica chimney, as shown in Fig. 1. Fig. 2 shows electrode holder or clip on an enlarged scale. A porcelain pillar is also supplied, which insulates the metal-work of the entire lamp. With this device no alteration of the lamp is necessary. The electrode spark points are below the level of the top on the chimney, so that drafts of air cannot divert the stream of gas from the spark.

Safety Third-rail System.

Much interest is displayed by the general public in systems of distributing current to street-railroad motors so as to avoid the use of exposed conductors.

A system of this character is being exploited by the Safety Third Rail company of New York. It is the invention of Captain J. McL. Murphy, and it has been embodied into a road now in operation at Manhattan Beach. The road equipped is the Marine railway, connecting Brighton Beach and Manhattan Beach, and it is 1,951 feet in length. The track is of standard railroad construction, with 56-pound, 4 1/4-inch T-rails and stone ballast, and differs from a trolley track only in the absence of the overhead

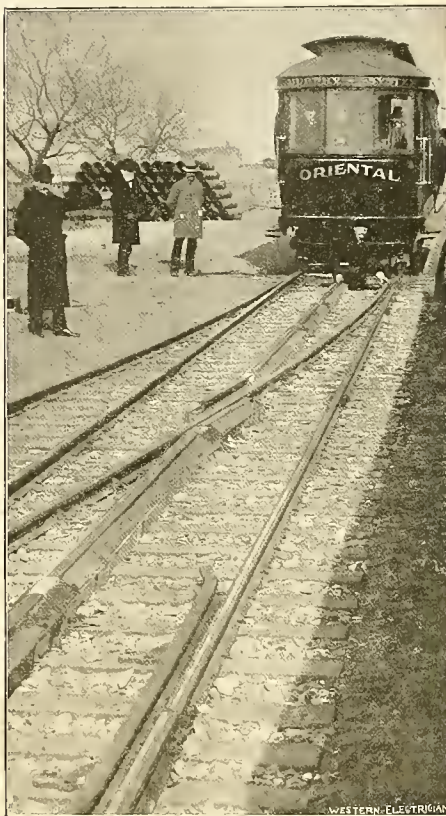


FIG. 1. SAFETY THIRD-RAIL SYSTEM.

system and in the use of the third rail, which is laid in sections or lengths on the ties in the center of the track. A standard 500-volt current, taken from a special dynamo located in the lighting station of the Manhattan Beach Hotel, is used.

The Murphy system accomplishes its object in the following manner: Referring to Fig. 1, a series of third rails is provided, as plainly shown, each of which is usually one-half a car or train length. By means of the automatic switch, Fig. 2, the sections are connected to the main supply wire or feeder at such times as the car is directly over the sections and making contact therewith. At all other times the sections are cut out or "dead."

The sectional third rails are so spaced that the car is taking current from one section before it leaves the one preceding, and thus the current supply is continuous as the car proceeds. The only live sections are those immediately under the car, and hence there are none exposed to do damage.

The Murphy system belongs to the electro-magnetic class; that is, the special feeding switches (Fig. 2) are operated, each by its electro-magnet, receiving currents from the car as it passes over the particular section to which the switch is allotted.

In a word, there is a switch to each section of rail. The switches are grouped as desired in a set of, say, two alongside the track, as in Fig. 3, or "bunched" and placed, say, in a weatherproof box or vault, as are the nine switches shown in Fig. 4.

The car is operated by a motor-dynamo (Fig. 5), which takes current from a few cells of storage battery and transforms it to the full line potential, rendering the car independent of the power-house current and able to pick up its switches anywhere. This little machine has sufficient capacity to handle two switches and supply the lights in the car.

Assume the car to be over a rail and ready to start. The switch being open there is no connection between the feeder and the car. The motorman operates the controller and connects the motor-dynamo to the third rail and to the ground, and current passes

through the fine wire of the switch and causes it to operate. In response to this current the plunger rises and first makes contact between the main feeder and the rail and then breaks the current of the fine-wire winding which first lifted it. The controller is now open, and current comes from the feeder through the coarse-wire winding of the switch to the third rail and from thence through the car motor to ground, causing the car motor to revolve and the car to move. The switch is held shut because of this main current in the coarse-wire winding. In this closed condition the switch will remain as long as the car is taking current from the section to which the switch is connected. When the car leaves the section, there is no longer any current passing through the switch feeding it, and it fall open, first, making another break in the circuit between the feeder and the sectional rail, and, second, restoring the circuit from the sectional rail through the fine wire to earth. The switch is then ready for the next car. The car being thus started, the motor-dynamo is no longer needed to operate the switches, because the car is provided with two sets of shoes which are connected together and placed sufficiently far apart to span the distance from section to section. The forward shoe, as it impinges on a section, subjects it to the full line potential, drawing its source of current from the rail preceding, for the main feeder has already been connected thereto in the manner just described. Once started, therefore, the car becomes independent of the motor-dynamo, for it uses the power-house current to operate the switches.

It will be noted that the switch remains closed until the car ceases to take current from the section it controls. It will then fall open from lack of current to hold it up and there is then no current to break, and hence no arc at the switch jaws, and it is therefore a non-arcing switch, and this is considered by many engineers as one of the most important features of the operation of the Murphy system.

CORRESPONDENCE.

New York Notes.

New York, April 10.—The rapid-transit situation is still troubled and indeterminate. A late development is the official announcement that a traffic agreement, to take effect not later than May 1st, has been entered into by the Manhattan Railway company and the Third Avenue Railroad company. This is an offset to the offer of the owners of the Metropolitan Street Railway company to take up the tunnel scheme. The agreement at present only contemplates transfer arrangements between the elevated



FIG. 3. SAFETY THIRD-RAIL SYSTEM.

lines and the crosstown and other connecting lines of the Third Avenue system, but it may lead to a closer union. The transfers are given for three cents additional fare, for both express and local trains. They will practically extend the facilities of the elevated system to Yonkers and New Rochelle, as well as giving the crosstown connections. Another aspect of the alliance lies in the fact that both systems contemplate electrical operation on a vast scale. A joint power house or system of power houses is therefore practicable and probable. The president of the Third Avenue company says: "With the installation of electricity upon the elevated and the lines of the Third Avenue railroad, the capacity of the combined railroads will be immediately increased more than twofold, and with the improvements and betterments already planned for prompt undertaking there will be provided for the traveling public through the united efforts of these two great railway systems a scheme for supplying rapid transit

broad enough to cover the possibilities of the need for many years to come." The agreement has had a good effect on the stock of both companies.

As to the Metropolitan offer for the proposed underground road, that is still pending, of course, as the amended rapid-transit act has not been finally disposed of by the Legislature. Governor Roosevelt says that it is the most important subject now before the state lawmakers. The offer of the Metropolitan people is being carefully scrutinized. Controller Coler states his conviction that the subway privileges will prove a greater source of profit than the working of the railroad itself. "They will give the Metropolitan people a monopoly in heat, light, power, telegraph and telephone wires," he says. "No one will be able to compete with them as a carrier of pipes and wires. If this franchise is to be granted in perpetuity, it is our duty to look ahead and see that the city is to get something commensurate with the privileges it is giving away." It is believed that in any event the franchise will not go to the Metropolitan people without modification.

his project contemplates the construction of an esplanade along the Boston embankment of Charles River, which flows between Boston and Cambridge. Under the esplanade the subway would be built, connecting Harvard bridge with the present subway, via a tunnel under Beacon Hill to Scollay square. The improvement of the embankment has been contemplated for three or four years; but the subway is a new idea. That it would assist materially in simplifying the transit problem is apparent to everybody in Boston and the southwestern suburbs. Cars coming in from Cambridge, Brighton, Newton, Watertown and Arlington, with their service for an aggregate population of more than 200,000 people, which now goes through the existing subway to a large extent, could be diverted, without inconvenience to passengers, into the proposed channel of traffic under the hill. Estimates show the cost of the subway alone to be \$2,502,500. The committee has taken the matter under advisement and will consider it in connection with the pending proposition from the mayor for a subway to connect with

Yetman, T. J. Killian, H. C. White and E. A. Smith. Historic Lexington and Concord are to have new electric railways this year, and it will be possible in future for patriotic folk to go over Paul Revere's famous route on the 19th of April in a trolley car. The line will connect at Arlington with the Boston Elevated Line under the name of the Lexington and Boston Street Railway company, and the Waltham, Ayer and Pepperell company will run through Concord and Lexington on its way from Waltham to Pepperell. Both these companies contemplate getting under way with their projects as soon as the weather is favorable for construction work.

The Northampton and Amherst Street Railway company has been organized with the following-named officers: President, F. S. Coolidge of Fitchburg; vice-president, B. E. Cook, Jr., of Northampton; clerk and treasurer, C. W. Wyman of Brattleboro, Vt.

In the annual report of the Massachusetts Board of Railroad Commissioners considerable space is devoted to the excellent results that have been ob-

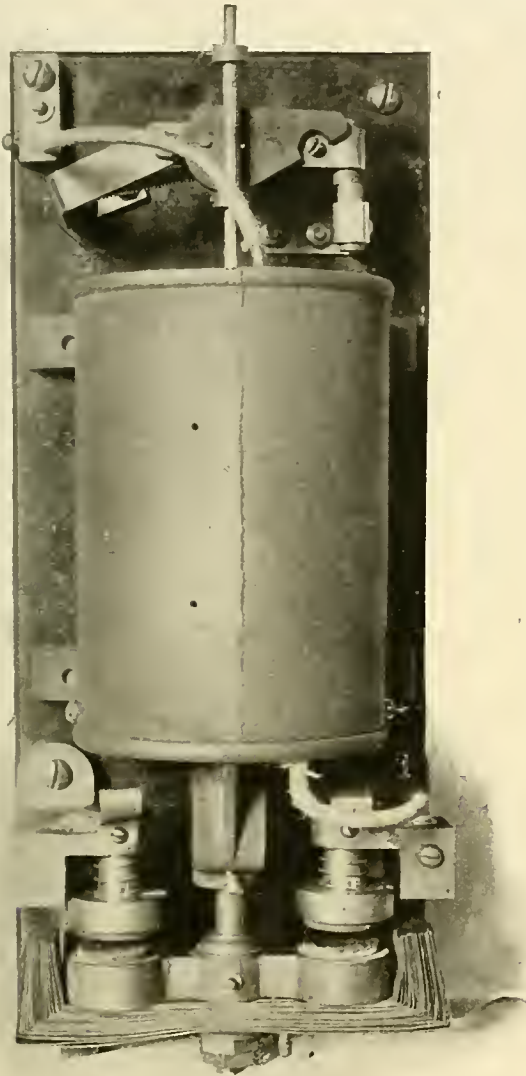


Fig. 2

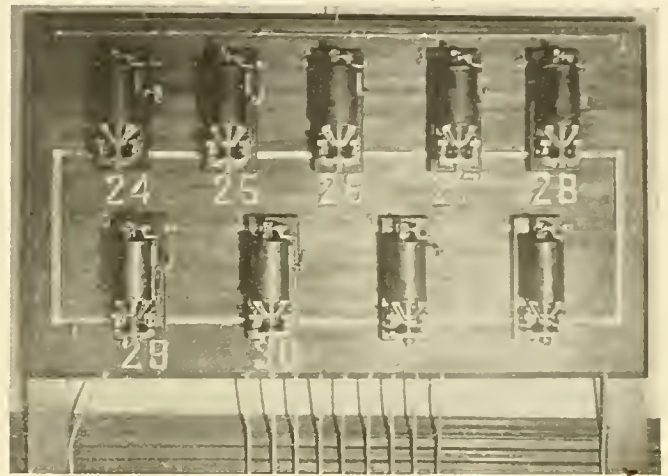


Fig. 4.

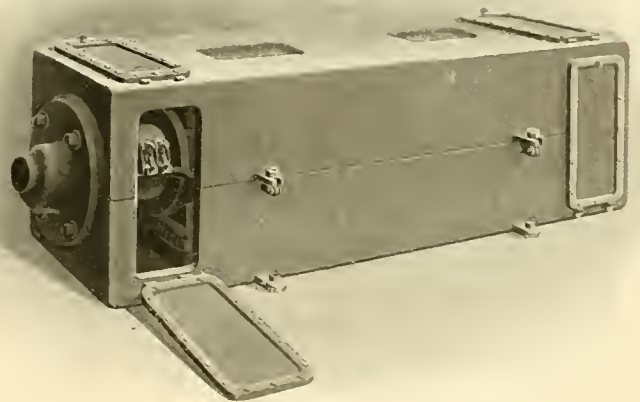


Fig. 5.

SAFETY THIRD-RAIL SYSTEM.

Another offer to construct the system has been received by the commissioners. It is from the Metropolitan Contract company, and the terms are thought to be more favorable to the city than those of Mr. Whitney and his associates. Frederic B. Esler, who is the president of the Metropolitan Contract company, offers to construct the tunnel for the sum of \$33,000,000, and will agree to pay to the city the interest on the bonds issued by the city for construction, and also create a sinking fund with which to pay off the interest of all the bonds before their maturity, so that the road and tunnel will become the property of the city at the end of the period prescribed by the act without the expenditure of any money whatever and absolutely clear of incumbrance.

Tammany has caught the municipal-ownership fever, and as a first step has declared in favor of city ownership of the gas plants. M. S.

New England News.

Boston, April 8.—Mayor Josiah Quincy of this city is continually making suggestions that surprise the average citizen, but at the same time impress people with their importance. His latest move is in the direction of another subway, and he appeared before the legislative committee on metropolitan affairs at the capitol last month with maps, plans and designs bearing on the subject. Briefly stated,

the Southern station via Washington street and other thoroughfares, submitted earlier in the session.

One of the most important jobs of construction work in connection with the new Southern station in this city is now under way at Fort Point channel, so called, where an immense drawbridge for six tracks is to span the water. It is to be of the style known as the rolling lift, and into its construction will enter upward of 3,000,000 pounds of steel. The Pennsylvania Steel company has the contract, and the operating power will be electricity supplied to Westinghouse motors from the power plant at the station. Counter-weights will be a feature of the structure, their weight being planned at about 1,700,000 pounds. On the north side of the channel the weight of metal in girders and other essential parts of the bridge will be 4,600,000 pounds.

A committee of 25 from the Electrical club of Boston has been appointed to make arrangements for the entertainment of the Telegraphers' association, which will hold its annual convention in September of this year in Boston. This club is composed of men well known in the various branches of electrical business. The officers, elected at the annual dinner in February, are as follows: President, H. J. Pettengill; vice-presidents, Charles E. Bagley, Frank Stevens, W. E. Durgin and Thomas W. Flood; secretary, M. C. Harrington; treasurer, Charles H. Haddock; governing committee, G. H.

tained, in the opinion of the commission, from the Boston subway since it was opened to the public for travel. Estimates of the gain in accommodations by the building of the subway are submitted, showing that the underground route is accommodating 50 per cent. more cars and more than twice as many passengers, compared with the number accommodated on Tremont street before the subway under that thoroughfare was constructed. It is shown that the entire cost of the subway, originally estimated at \$5,000,000, will probably be less than \$4,250,000, exclusive of the alterations that will be necessary to adapt it to the use of the elevated railway. The commissioners' statistics show that 330,000,000 passengers were carried during the year by the street railroads of the state, a gain of more than 22,000,000 for the year. The total capital investment advanced during the 12 months to \$68,758,800. This includes capital stock and net debt. The gain is upward of \$5,500,000 for the year. The ratio of surplus to capital stock stood higher at the end of the last year (4.41 per cent.) than in any previous year since 1800. Cash dividends declared aggregated \$2,076,233, being an increase of \$10,000 over the 1807 dividend record. Total income for all the companies amounted to \$18,247,235.81, while total expenditures, including dividends, were \$17,789,466.70, the balance of \$457,769.02 being carried to surplus. There were 54 companies that paid no dividends and 49 that paid

amounts ranging from $2\frac{1}{4}$ per cent. for the lowest up to 8 per cent. preferred and 7 per cent. common, distributed by the Boston system. The companies that passed dividends, however, represented only about one-tenth of the capitalization of the entire list. The number of passengers carried by the street railways exceeded the number carried by the steam railroads of the state by 228,948,907. The total length of track operated on is about 1,623 miles. The additions for 1898 amounted to about 128 miles. Only $7\frac{1}{2}$ miles of this remain unequipped with electricity, and a petition has been submitted this month in Boston for the substitution of electricity for horse power on the quaint old-fashioned little line on exclusive Marlboro street in the Back Bay section, where the residents hitherto have almost unanimously clung to the ancient style of travel.

The Boston Light, Heat and Power company, which has been reaching out for a number of prosperous small plants in New England cities and towns, has recently made an offer for the Willimantic (Conn.) Electric Light company and Citizens' Gas-light company, also for the gas and electric concern in Spencer, Mass., owned by the men who control the Willimantic plants.

The legislative committee that has been hearing testimony on the need of replacing the tracks of the street railway on Tremont street, ordered up when the Boston subway was constructed, has presented a report favoring the restoration of the tracks in that thoroughfare.

W. Clifford of Pittsburg, agent for the Cappell electric fan, has been awarded the contract for installing a ventilating fan at the main shaft of the Hoosac tunnel. The fan will be 16 feet in diameter, with a capacity of 600,000 cubic feet of air per minute. It will be driven by power from the North Adams Electric company.

An adverse report has been given by the committee on street railways in the Massachusetts Legislature on the petition for vestibules for the front platforms of cars in Boston in the winter months. It was argued strenuously before the committee at hearings given on the subject that the safety of the public would be lessened by the adoption of this protection for motormen, and remonstrants against the idea said that there would be danger in crowded cities of collisions in case the view of the motorman on a car should be obstructed.

Two companies are bidding for the privilege of doing a motor-carriage business in Boston. The matter came before the Board of Aldermen, and petitioners representing what is known as the Boston Transit company were given a hearing. Representatives of the other company which desires to secure a franchise for similar purposes were present, not in opposition, but to ask for a continuance. It was stated that this company was incorporated in New Jersey as the New England Electric Vehicle and Transportation company, and had secured the New York city privilege, being in successful operation there. The Boston company is incorporated under the laws of Massachusetts, and has a number of Boston capitalists back of it. B.

PERSONAL.

Dr. J. J. Deshler of Glidden, Iowa, was in Chicago early this week.

Captain W. L. Candee of the Okonite company of New York was a Chicago visitor early in the week.

H. W. Hill, president of the Hill Clutch company of Cleveland, Ohio, is spending a few days in Chicago.

Mr. Jay Holmes, at 39 Cortlandt street, New York, has assumed the general agency for the Onondaga Dynamo company of Syracuse for New York city and the territory contiguous thereto.

Mrs. J. B. Keller, mother of E. E. Keller, general manager of the Westinghouse Machine company of Pittsburg, died at her home in Rochester, on April 10th, aged 63 years. Mrs. Keller was for 40 years a resident of Rochester and was highly esteemed.

Clinton L. Rossiter, president of the Brooklyn Rapid Transit company, is in Chicago, where he is inspecting the elevated electric-railway systems. Electricity will be introduced on the lines of the Brooklyn Elevated company, recently leased to the Rapid Transit system. Mr. Rossiter may use the Sprague multiple-unit system of control now in use on the South Side system and has promised that when this is done he will run cars on the Brooklyn elevated line at two-minute intervals throughout nearly all of the 24 hours, instead of the long intervals now in vogue. As President Rossiter's health has been affected by the work incidental to the acquisition of the big properties recently secured by the Brooklyn Rapid Transit company, he is making his visit one of pleasure as well as business.

ELECTRIC LIGHTING.

The Redwood City (Cal.) trustees will call an election for May 20th to vote \$4,125 for a new electric-light plant and \$8,000 bond, for new water mains.

The city of Vincennes, Ind., will receive proposals for lighting the city with electricity and with gas on May 22d. The contract will extend for 10 years and will carry with it a franchise for private light-

ing. Bryan & Humphrey, St. Louis, Mo., are consulting engineers for the city.

It is reported that Stewart Lyons is making arrangements for the erection of an electric-light plant for municipal and domestic purposes in Coquille, Ore.

The Fisher's Island Electric Light, Heat and Power company has been incorporated to do a general electric-lighting business at Fisher's Island, N. Y. The capital stock is \$10,000.

Residents of Tucson, Ariz., think that an electric-light plant is badly needed in that town. Judge C. W. Wright, in a recent address, said that a \$50,000 plant should be erected.

Fire broke out recently in the electric-lighting plant at Union, Ore., and the plant was so badly damaged that an entirely new plant will be necessary. The owners will rebuild at once.

The city of Fulton, Mo., has voted \$4,000 for improvements and enlargements in its municipal lighting plant, and has placed the work in the hands of Bryan & Humphrey, consulting engineers, St. Louis, Mo.

The issue of \$50,000 worth of bonds voted about a year ago for a municipal light plant and a water system in Healdsburg, Cal., and over which there was some trouble, has been declared legal, and Healdsburg can now erect its own electric-light plant.

A new gas and electric-light plant is to be established at Santa Monica, Cal., by the Santa Monica Electric and Power company, which now furnishes light to the city. The new electric plant will include a 500 horse power steam engine, one electric generator of 500 kilowatts capacity and two smaller generators of 600 kilowatts each.

On March 28th a meeting of the new Twin City Electric company was held at Grand Rapids, Wis., and it was decided to build at once a new and up-to-date plant. It is the intention of the company to furnish light for the cities of Grand Rapids and Centralia, as well as power for several factories and milling companies. The capital stock of the incorporation is \$20,000.

Sag Harbor, Long Island, famous as a whaling port in days gone by, is going to get abreast of the times, for the Board of Village Trustees has granted to Robert K. Story of New York permission to establish an electric-light plant there. Mr. Story says that he will erect electric lights throughout Sag Harbor and furnish better lights than that given at present, at a rate cheaper than the cost of now lighting the streets.

PUBLICATIONS.

The Western Electric company, Chicago and New York, has issued Bulletin 19 F, which describes the Arctic ceiling fan and accessories. This is the fourth of a series of bulletins describing the various fan motors manufactured by the Western Electric company.

The enterprising Pelton Water Wheel company of San Francisco and New York has issued a handsomely printed and illustrated catalogue of 90 pages entirely in Spanish. It relates to the "Rueda Hidraulica Pelton," and all tables and dimensions are given in the metric system. This is a very practical and sensible way to assist American trade extension in Mexico, Central and South America. As there is an immense field for the introduction of water-power transmitting machinery in the Spanish-American countries, the new catalogue should amply repay the care and money expended on it.

The "Universal Electrical Directory" (J. A. Berly's), published by H. Alabaster, Gatehouse & Co. of London, is out for 1899. This is the well-known red-covered electrical directory, and the publishers' price is six shillings. It contains the names of the members of the electrical and kindred industries throughout the world. The British alphabetical section now comprises about 9,845 names, the Continental section 8,195 names, the American 5,304 and the Colonial 2,120, a total of 25,464, approximately 1,670 names of individuals and firms more than were contained in the book for 1898. For simplicity and facility of reference the book is divided into four groups, British, Continental, American and Colonial, which are again subdivided into alphabetical and classified sections. In addition to the new names incorporated in the present issue, much financial information is given, the telegraphic addresses and local telephone numbers are given, and the total of pages added to the work is 64, as compared with that of 1898, making in all about 1,182 pages entirely of directory matter.

ELECTRIC RAILWAYS.

Tom L. Johnson, the widely known street-car manager, in an interview in Cleveland, is quoted as saying: "The time is going to come when the people will ride free upon the street cars run and operated by a municipality, the same as they now get their letters delivered to them by the postal system. Municipal control is as easily handled as governmental control. Politics would not be able to cut any fig-

ure. In every separate organization, where the servants of the company, government or municipality are subject to examination by public sentiment, where free access to the inner workings is made possible, no corruption is found. It is only in the hidden byways that political chicanery can be possible."

The City Council of Gothenburg, Sweden, has decided to purchase the concession and stock of the Gothenburg Tramway company, paying therefor £70,000. It is as yet undecided whether the municipality will build and operate electric tramways or will lease the right to do so to an operating company.

The owners of the Wellington Extension mine at Oyster Bay, B. C., have let a contract to the firm of George C. Hinton & Co. for the placing of a complete tramway and electric-light system, the first cost of which will be about \$60,000. It is expected that the plant will be in position by the middle of summer. The electric tramway line will be about five miles long and operated by two 150 horse power generators.

The Batte (Mont.) Inter Mountain says that W. A. Clark and W. L. Hog, constituting the Silver Bow Railway company, have purchased the Columbia gardens, about four miles east of the city, and will construct a new electric line to that resort. The new corporation agrees to construct a new double track from the junction to the gardens, a distance of two miles, the road to be operated by electrical power.

The Northeast electric railway of Kansas City is being rebuilt. This line consists of five miles of double-track extending from Fifth and Walnut streets, on Fifth street to Independence avenue and thence out the latter thoroughfare to Budd Park. The new rails weigh 103 pounds to the yard, and steel poles support the suspension wires for the overhead conductors. The Electric Installation company of Chicago has the contract for the overhead construction work.

Negotiations are said to be in progress by which Henry Everett, the Cleveland street-car magnate, and his associates will likely secure possession of the plant of the Akron (O.) Street Railway and Illuminating company. It is understood that the Everett people have made a cash offer amounting to \$1,250,000 for the property, and the offer will probably be accepted. The street railway has just secured a 25-year extension franchise, and in return will carry passengers for a four-cent fare.

The Grand Rapids, Grand Haven and Muskegon Railway company was incorporated last month, with a capital stock of \$100,000, to build 40 miles of electric railroad between the Michigan towns named in the title. The company is preparing to make surveys and complete preliminary work for the road and for three draw and pile bridges. When this is finished contracts will be let. The officers of the company are: President, Thomas F. Carroll; vice-president, David A. Crow, Grand Rapids; secretary, C. W. Taylor, Detroit, and treasurer, Joseph Kirwin.

It is admitted by stockholders of the Tarrytown, White Plains and Mamaroneck electric railroad that the road has been sold to the Union Railroad company. The price is said to be about \$550,000. The company owns 20 miles of franchises in Westchester County, New York. A line is in operation from Tarrytown on the Hudson to Mamaroneck on the sound, passing through White Plains. A short time ago the town authorities of East Chester and Scarsdale gave a franchise from Mount Vernon to White Plains, enabling the road to make a connection with the Union railroad in Mount Vernon. The Union Railroad company now has all the surface lines in Westchester County except two small local roads, one in Larchmont and the other in Port Chester. The company, since it has become allied through the Third Avenue company with the Manhattan Elevated of New York city, is promising the people of Westchester County and the Bronx rapid transit to Manhattan. It proposes to double-track its lines wherever possible and connect with the elevated road at One-hundred-and-seventy-seventh street. A fare of five cents will be charged from all parts of Westchester County to One-hundred-and-seventy-seventh street.

ELECTRICAL SECURITIES.

The directors of the Edison Electric Illuminating company of Boston offer to stockholders of record on April 6th 1,702 shares of the capital stock of the company at \$120 per share, at the rate of one new share for every 22 old shares now held. This distribution leaves in treasury of company 58 shares, which, with any of the above issue not subscribed for, will be sold by public auction at such time as the directors may order. Rights to subscribe will expire at the close of business on May 13th.

ELECTRIC VEHICLES.

The Electric Process company (capital, \$125,000) has been incorporated at Newark, N. J., to run cars in Pennsylvania cities by leasing franchises.

The Lewis Motor Vehicle company has been incorporated at Trenton, N. J. The capital stock is \$5,000,000. Thomas W. Synnott and Harry A. Berwind are incorporators.

TELEGRAPH.

Gen. A. W. Greely, chief of the Signal Service, is now in Cuba, to confer with Col. Dunwoody about the operation of the telegraph lines in that island. At present volunteers operate the telegraph lines. As they are to be mustered out a new arrangement must be made to operate the lines by civilians or by the enlistment of the Volunteer Signal Corps. It is this condition that Gen. Greely hopes to arrange.

The overland telegraph lines connecting Havana with Santiago have been completed by the Signal Corps. They place the commanding general in Cuba in communication with every command and all the important towns of the island. The corps has constructed 200 miles of line in sixty days. The trunk line extends from Pinar del Rio through the center of Cuba to Baracoa, the extreme eastern port. Nine lines north and south cross the trunk line.

INDUSTRIAL COMBINATIONS.

It is said that the new Consolidated Street-car company will take over the street-car business of Pullman's Palace Car company of Chicago and absorb the following-named concerns: J. G. Brill company, Philadelphia; St. Louis Car company, St. Louis; American Car company, St. Louis; John Stephenson company, New York; J. M. Jones' Sons, West Troy, N. Y.; Kuhlman company, Cleveland, O.; McGuire Manufacturing company, Chicago, and Peckham Truck company, New York.

MISCELLANEOUS.

It is stated that the French government is so pleased with the success of Marconi's wireless-telegraph experiments across the English Channel that it proposes to have him conduct experiments between the South Foreland lighthouse, the present experimental station in England, and the Eiffel Tower in Paris, a distance of 230 miles.

A crank wrote to Mayor Ashbridge of Philadelphia the other day to suggest that electric-light wires be placed in the reservoirs and in the bed of the Schuylkill River, and that at stated periods every day heavy alternating currents of electricity be transmitted through them. By this method, the writer argued, all fever microbes and germs would be killed or rendered harmless.

The public printer is inviting sealed proposals, until May 4th, for furnishing the Government Printing Office electrical supplies during the fiscal year ending June 30, 1900. Detailed schedules of the articles required, accompanied by blank proposals, and giving the regulations with which bidders must comply, will be furnished upon application to F. W. Palmer, public printer, Washington, D. C.

The lower house of the Missouri Legislature has passed the bill introduced by Mr. Fitzgerald to tax franchises. It names almost every class of business, including incorporated banks, railroads, street railways, telegraph, bridge, ferry, telephone, sleep-ing-car, gas, water, electric-light and power companies, and provides that they shall pay the same tax on their franchises as is paid on other kinds of property. It is estimated that this will add many millions to the values for the purpose of assessment, particularly in St. Louis and Kansas City. An emergency clause was passed, so that if the bill becomes a law it can take effect in time for this year's assessment.

TRADE NEWS.

On March 27th the office and factory of the Shawmut Fuse Wire company at 93 Federal street, Boston, were destroyed by fire. The company has secured permanent quarters at 161 High street, where it will be pleased to receive its customers and friends.

The Weston Electrical Instrument company is making contracts for its new factory at Waverly, N. J., a suburb of Newark. A railway switch is now being constructed to the spot, and ground will be broken in a few days for the erection of what will be one of the most complete manufacturing establishments in the United States.

The Smith & Hemenway company of New York, which recently purchased the entire hardware business of the Maltby-Henley company and the Bindley Automatic Wrench company, has been forced by reason of the absorption of these companies to seek larger quarters, and after May 1st will be pleased to see its numerous friends and customers at the new address, 296 Broadway.

The Commercial Electrical Supply company of St. Louis has passed out of the hands of Joseph

Franklin, D. H. MacAdam and Joseph Franklin, Jr. Funds to meet all indebtedness of the company are now in treasury of the newly organized company, and all claims will be met as they fall due. The company has passed into the control of Mr. William F. Nolker, sons and associates, who have ample means to make the company one of the foremost supply houses of the West. The capital stock will soon be increased, and it is probable that the management and arrangement as to agencies will continue about the same as in the past.

The Gate City Electric Supply and Construction company of 74 North Broad street, Atlanta, Ga., has been organized to do a general electrical supply and construction business throughout the South. The officers of the new company are: President, W. H. Turner; vice-president, J. D. Turner; secretary, Dr. J. P. Kennedy; treasurer and general manager, Oscar C. Turner; superintendent, D. A. Jett. Mr. Oscar C. Turner, the general manager, has been identified with the electrical business of Atlanta for the last seven years, and was with the Georgia Electric Light company as purchasing agent before he went into business for himself. The company will carry a large stock and will endeavor to sell and do "everything electrical."

The many friends in the electrical trade of W. F. Hanks, until the late consolidation of electrical journals with the Electrical Engineer, and of E. L. Powers, "the American Directory man," formerly of Chicago, will be interested to know of the organization of the E. L. Powers company and its purchase of "Johnston's Electrical and Street Railway Directory," formerly published by the W. J. Johnston company. The new company will have E. L. Powers as president, E. L. Blanchard as vice-president and W. F. Hanks as secretary and business manager, and quarterly "American" directories will be issued, covering every branch of the electrical industry. The combination of the efforts of three such experienced men as Messrs. Hanks, Blanchard and Powers, possessing, as they do, also, the confidence of the trade both East and West, cannot fail greatly to strengthen publications which are already well appreciated.

The Pelton Water Wheel company has recently installed two wheels in the Ophir mine on the Comstock under such extraordinary conditions as to head as to be worthy of note. One of these is a 32-inch wheel, direct-connected to a dynamo used for lighting the mine, and the other a 36-inch wheel, direct-connected to a blower for the purpose of ventilating the various shafts, drifts and stopes. Both of these wheels are located at the Sutro tunnel level and run under a vertical head of 2,020 feet. This is believed to be the highest head under which any water wheels have ever been operated, except a similar wheel furnished an adjacent mine some years ago, which runs under a 2,100-foot head. Upward of 30 Pelton wheels are running the various Comstock mines, under heads varying from 1,200 to 2,100 feet, operating dynamos, blowers, hoists, etc., many of which have been running several years with practically no expense in the way of repairs. From these references it will be seen that there is hardly any limit to the pressure under which these wheels can be safely and efficiently operated.

BUSINESS.

The Western Electric company has recently distributed a number of its catalogues on Petite arc lamps. Any reader of the Western Electrician desiring a copy may secure one by writing to the company for it.

The officers of the Fort Wayne Electric corporation report a good business in spite of recent difficulties. The Chicago office has just sold three 125-volt multipolar dynamos of 130 kilowatts each to the Plankinton estate at Milwaukee. These machines will be direct-connected to three engines. This order makes a total of six Fort Wayne dynamos sold to the Plankinton estate.

The L. P. & D. Transmitter company of Montpelier, Vt., says that it is getting considerable business from owners of isolated plants, as well as from central stations, that want to increase their capacity but are short of room for any additional machinery. Belted apparatus can be bought cheaper than direct-connected, and often it gives results that are just as good.

Users of copper wire who have scrap copper wire on hand will be enabled to realize on it by communicating with the Swarts Metal Refining company, 20 North Desplaines street, Chicago, which makes a specialty of buying up old wire of this kind. The Swarts company is perhaps the largest concern of

the kind in the country, and is well known among the electrical fraternity.

The Turner Engineering company of Bucyrus, O., is furnishing the Turner water-tube boiler (250 horse power) for the Findlay, O., street railway; two of 200 horse power each for the Central Traction company; three of 225 horse power each for the Indianapolis Ice and Cold Storage company. Large boilers of this type recently put into service are showing excellent results.

The Safety socket hook (see that "snap"!) is an original specialty of the Electric Appliance company. The special feature is a spring which holds the socket hook firmly in place on the screw-eye which is used in connection with it, thus preventing the lamp from being broken by being jarred or knocked from its position. The safety socket hook seems to be a marked improvement over the regular style.

In the Truitt regulating lamp the Central Electric company, Chicago, is placing on the market a desirable addition to electric-lighting appliances. A positive deficiency is one of the strong recommendations, for it lacks resistance and inductive features in its operation. Starting with lamp without current, simply turning it in the socket produces one, eight, 16 or 24 candle power illumination, as may be desired. This is secured by a simple departure from the ordinary socket mechanism, and by dividing the lamp base into three segments, these segments being connected to the two lamp filaments. Through series and multiple current application, together with the current given individually to the two filaments, the variation in candle power is obtained with remarkable freedom from complication. Any lamp of proper voltage operates equally as well on direct or alternating current. The Truitt regulating lamp has been tested eight months, it is said, with best results.

On the subject of fan-motor prices, the Emerson Electric Manufacturing company of St. Louis writes: "While we do not desire to change the prices that have been named by us at the beginning of a season, the conditions surrounding the price of raw material are so unusual that we are certain that we shall be forced to make an advance in the price of fan motors and ceiling fans within a very short time. We write you of the facts in the case so that you may understand that we are not attempting to take advantage of you by advancing our prices without again notifying you, and we will say that if you are in a position to place a definite order for any quantity of fan motors and ceiling fans prior to April 15th we shall accept the order on or before that date at the prices named in the schedule which was sent with fan-motor catalogue [of March 1st]. Any motors which you order from us prior to April 15th may be ordered shipped forward at any time prior to August 1st next, but when the number of motors on that order are shipped we can only accept further orders from you at the prices which may be ruling on the date order is received by us."

On Thursday morning, April 6th, a party of gentlemen visited Coney Island, under the guidance of Captain J. McL. Murphy, inventor of the safety third-rail system, on a trip of inspection over the Manhattan Beach safety third-rail road. The party included Henry L. Doherty, New York; Captain E. W. Brady, Washington; Irvin Butterworth, Columbus, O.; E. V. Baillard, New York; Arthur J. Wood, New York; J. S. Campbell, Gravesend, L. I.; M. J. Mandelbaum, Cleveland, O.; Will Christy, Akron, O.; Louis Steckler, New York; B. Mahler, Cleveland; J. McLeod Murphy, New York; W. M. McBillesby, New York. Without going into details, it should be stated that the point which would first strike many electrical engineers as being most valuable relates to the non-arc nature of the switches employed by Captain Murphy. Each of these switches, which serve to keep "alive" only the portion of supply rail beneath the car, is of such construction that it operates to make the circuit, and not to break it. Those who have watched the progress of the Safety Third-rail company will be interested to know that the day before this trip was made two gentlemen from Holland, Messrs. A. de Ritter, Jr., and Henry J. Spyster, both of Amsterdam, inspected the Manhattan Beach road in operation. Doubtless no higher compliment has been paid this system than the remarks made at that time by Mr. Spyster to Electrical Engineer E. V. Baillard of the Safety Third-rail company. Mr. Spyster said: "I am not afraid to say that I recommend this system. I will cable my opinion to my people." These two men represent the city authorities of Amsterdam. The party was most royally entertained in Minden's Hotel at luncheon by the Third-rail company.

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued April 4, 1899.

622,207. Driving Mechanism. Herman B. Collins, Fulton, N. Y. Application filed April 10, 1896. Renewed September 6, 1898.

The actuating wheels for communicating motion from one of the parts to the other are revolvable on axes arranged at an angle with the axes of the revolvable head and the driver, an electric motor having its armature connected to the driver, and a fan actuated by the motor and arranged in proximity thereto for preventing heating of the motor.

622,210. Apparatus for Illustrating the Phenomena of Thunder and Lightning. West Dodd and Alvin D. Struthers, Des Moines, Ia. Application filed June 13, 1898.

A case is employed having one side hinged at its bottom to extend horizontally to serve as a door, with a frame fixed to the inside face of the door, a cross piece at the center of the frame to produce two compartments, a cover fixed on top of the frame and cross-piece to serve as a platform, an electric accumulator fixed in each compart-

ment, means for storing electricity in the accumulators, and means for discharging electricity to objects placed on the cover and platform.

622,214. Trolley Wheel. Silas W. Fletcher, Lowell, Mass. Application filed July 25, 1898.

The combination of a core, side plates arranged on opposite sides of the core, a series of concentric tread-washers, surrounding the core between the side plates, and bolts passing through the side plates and through holes formed partly in the core and partly in the washers.

622,225. Water Guard for Trolley Ropes or Poles. Thomas Hawken, Rockland, Me. Application filed October 31, 1898.

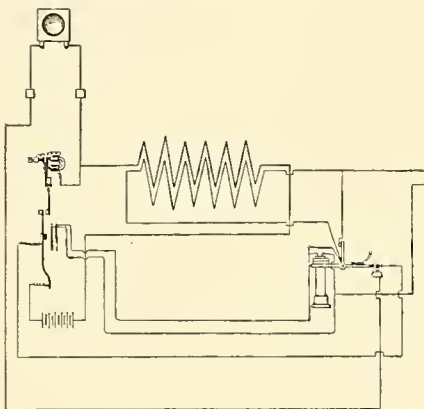
A guard for a trolley rope or pole consists of a block comprising sections adapted to be secured together and having a hole through it, the block adapted to embrace the rope or pole and be adjusted to any point thereof for the purpose of shedding water at that point.

622,230. Controlling Switch for Electric Motors. Reese Hutchison, Mobile, Ala. Application filed December 9, 1898.

There is an automatic lock for the switch and an electromagnetic device to control the lock, the electromagnetic device being connected with the motor circuit and so adjusted that upon the establishment of a predetermined strength of current the switch is released.

622,268. Telephone-switchboard System and Annunciator. George B. Rodgers, Knoxville, Tenn. Application filed April 27, 1898.

An annunciator having a pair of lines and a pair of restoring-magnet coils, the coils being alternately arranged so that a plane passed through the longitudinal axes of the line coils would intersect a plane passed through the longitudinal axes of the restoring coils, an armature normally over one pair of coils pivoted to swing from one pair of coils to the other, and arms on opposite sides of the armature extending toward one pair of magnet coils when the armature rests over the other pair, and stops limiting the swing of the armature.



No. 622,645.

mans, Evanston, and Norman Whichello, Chicago, Ill. Application filed January 29, 1898.

The equipment includes a hoisting motor, circuits therefor, main and reversing switch contacts arranged in the circuit, of a motor-magnet, including an armature and shaft, a main switch arm and a reversing switch arm mounted on the shaft of the motor-magnet armature and co-operating with the contacts, and means for controlling the motor-magnet.

622,450. Insulating Material. Julius De Long, New York, N. Y. Application filed July 20, 1898.

This material consists of a mixture of cattle hair, ground corncob, ground cornstalk pith, jute waste and mineral wool.

622,452. Magneto-electric Motor-dynamo. Fred H. Donaldson, Garvanza, Cal. Application filed April 16, 1898.

A field composed of a series of permanent magnets suitably arranged and supported at substantially equal distances apart, and an armature comprising a shaft and a series of electromagnets extending at right angles from diametrically opposite sides thereof in the same longitudinal plane and arranged to alternate with the permanent or field magnets are the principal features of the invention.

622,466. Electric Railway or Tramway. Jean J. Heilmann, Paris, France. Application filed November 9, 1898.

An electric-railway system in which the alimentary current for the train motors is furnished by a generator in a fixed station, the generator being excited by a special dynamo, the field circuit of which is controlled from the train by means of an auxiliary wire or conductor.

622,472. Typewriting Machine. William T. Hoofnagle, Baltimore, Md. Application filed October 22, 1897.

A feature of this machine is a pivoted armature and one or more magnets movable toward and from the pivot point of the armature, and connections between the armature and type wheels whereby the latter will rotate in unison when the armature is moved.

622,481. Means for Securing Electrical Unity of Systems of Metallic Pipes or Mains. Dugald C. Jackson, Madison, Wis. Application filed October 12, 1898.

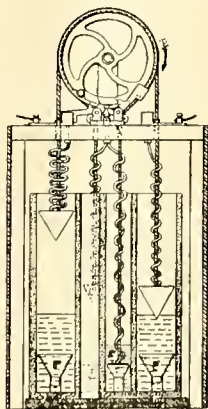
A length or section of fluid-conducting pipe or main having an enlarged portion formed thereon is adapted to be connected with an electrical conductor, whereby an effective electrical joint may be obtained between the section or length and an adjoining section or sections, and the main is preserved from deterioration.

622,596. Apparatus for Holding and Connecting Guard Wires of Electric Cables or Other Wires. Ralph Bostock and Frank A. Cheetham, Brighthelm, England. Application filed November 29, 1898.

Hooks are pivoted at opposite points of a block; weighted crank levers are pivoted in the block, and connections are made between the block and the hooks, so that wires in tension attached to the hooks will be held until the tension is relaxed, when the weighted lever will release the hook from same.

622,606. Contact for Controllers. George H. Condict, New York, N. Y. Application filed February 7, 1899.

The controller cylinder and raised contact bars thereon, with a stationary bracket and an insulating support therefor parallel with the controller, a detachable spring-pressed hinged contact finger adapted to engage the contact strips of the cylinder, a stop adapted to be engaged by a portion of the finger to limit its downward movement and an independent electrical connection between the outer portion of the contact finger and the circuit to be connected.



No. 622,628.

622,607. Electrical Advertising Machine. Harry W. Cox, Nottingham, England. Application filed July 15, 1898.

Removable plates are carried by frames and made with raised portions which represent the advertisement to be reproduced; brushes make contact with the lamps to be lighted; ratchet mechanism rotates the drum and limits its motion.

622,608. Electrical Advertising Machine. Harry W. Cox, Nottingham, England. Application filed September 15, 1898.

A group of lamps is employed with spring contacts or brushes arranged in rows, a cylinder for each of such rows, selecting fingers carried by the cylinders and making direct electrical connection with the lamps through the spring contacts or brushes, a rod for such fingers to turn upon, a second rod for limiting the motion of the fingers, and a third rod for holding the fingers in their selected position.

622,609. Carbon Brush-holder. Renwick E. Crockett, Michigan City, Ind. Application filed November 29, 1898.

A carbon brush-holder comprises a body arranged for attachment to the brush-holder support, a brush casing arranged to slide in the body, a tension device connected

with the brush casing and acting in the direction in which the casing is adapted to slide, and means for holding the tension device in position.

622,618. System for Overhead Electric Wires. William Glasgow, Chicago, Ill. Application filed January 30, 1896.

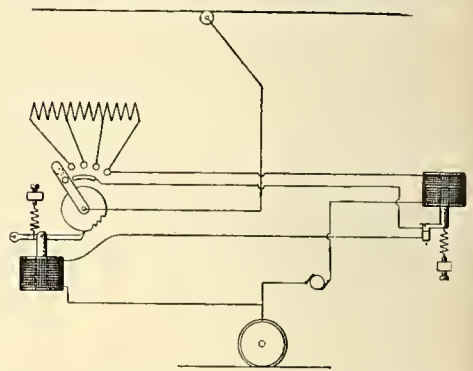
The line wire is divided into separate divisions of a continuous and unbroken nature, independently supplied with the electric current, a series of intermediate hangers supporting each division of the line wire, switches supported by the hangers, switch-operating arms connected to the switches and to the line wire, and adapted to operate the switches upon the breakage or undue sagging of the line wire, these switches having branch connections with the line wire and with a suitable return conductor.

622,627. Resistance and Contact Apparatus for Electric Currents. Henry Lyon, Glasgow, Scotland. Application filed July 6, 1898.

Two liquid-containing jars are employed, in the bottom of each of which is a metal cup having electrical connections; there are also a metal cone, suspension cords and pulleys for the cones, flexible coils of wire connecting the cones to separate conductors, and handles to operate the pulleys.

622,628. Resistance and Contact Apparatus for Electric Currents. Henry Lyon, Glasgow, Scotland. Application filed July 6, 1898.

Resistance and contact apparatus for main and shunt electric currents having liquid-containing jars comprise a metal cup in each jar, metal cones in the jars, a pulley to which the cones are secured, so as to cause certain cones to make contact and others to break contact upon the operation of the pulley, in combination with hinged contact pieces and means carried by the pulley for operating the contact pieces.



No. 622,230.

622,629. Multiple Telegraph. Ernest J. P. Mercadier and Henri R. J. Pierquin, Paris, France. Application filed January 3, 1896.

In a system of multiplex telegraphy produced by the employment of alternate or undulatory vibrating currents, there is in combination with the vibrators or tuning forks an equal number of induction converters, the two joint induction coils whose primary wires are in circuit of the secondary wires of the converters, the graduated condensers shunting the secondary wires of the coils, and the telephonic translator having its wires connected with the secondary wires of the joint induction coils.

622,636. System of Multiplex Telegraphy. Henry A. Rowland, Baltimore, Md. Application filed April 27, 1896.

This method of transmitting intelligence consists in dividing the waves of an alternating electric current into groups, modifying one or more of such groups by suppressing one or more waves therein and transmitting the modified current over a line.

622,639. Electric Meter. Gustave A. Scheffer, Peoria, Ill. Application filed January 20, 1899.

The motor armature described consists of a metallic disk or plate provided with radial saw cuts or slits extending nearly to the periphery of the disk, in combination with a suitable commutator device for supplying current to the individual segments or portions of the armature.

622,645. Electro-harmonic Signaling Apparatus for Telephone Systems. Fred H. Brown, Chicago, Ill. Application filed May 3, 1897.

The apparatus described includes an induction coil, a line wire included in circuit with the secondary of the induction coil, a battery having one of its poles connected to one terminal of the primary of the coil, a switch lever connected to the other terminal of the battery, contacts arranged to be respectively engaged by the lever, a circuit including one of the contacts and connected to the other terminal of the primary of the coil, an electromagnetic interrupter arranged in the circuit, an auxiliary circuit including the other of the contacts, a local transmitter arranged in the auxiliary circuit, means for normally holding the lever in position to open the interrupter circuit, and to close said auxiliary circuits, in combination with a distant receiver arranged in the line circuit whereby when the lever is moved to close the interrupter circuit the diaphragm of the distant receiver vibrates harmonically and synchronously with the interruptions in the interrupter circuit.

622,646. Electric Signaling Apparatus for Telephone Systems. Fred H. Brown, Chicago, Ill. Application filed May 3, 1897.

The first claim is given: In a signaling apparatus for telephone systems an induction coil, a battery having one of its terminals connected to one terminal of the primary of said induction coil, a circuit connection leading from the other terminal of said battery, a switch lever arranged in said circuit, a pair of contacts so relatively arranged with respect to said switch lever that when said lever is contacting with one of said contacts it is out of contact with the other, a circuit connection from one of said contacts to the other terminal of the primary of said induction coil, an electromagnetic interrupter arranged in said circuit connection, an auxiliary circuit connection leading from the other of said contacts, a local transmitter arranged in said auxiliary circuit connection, means for normally holding said switch lever in position to close said auxiliary circuit to the battery, and to open the electromagnetic interrupter circuit, a line wire included in circuit with the secondary of said induction coil and a distant signaling device arranged in said line circuit.

622,328. Magneto Ear-Phone. Frank H. Collins, Everett, Mass. Application filed February 21, 1898.

A transmitter is connected with the battery, and is adapted to be secured to the apparel of the user, a receiver also connected with the battery and coil, the receiver consisting of a suitable casing in which is contained an electromagnet, a deflected tube secured to the end of the casing and a diaphragm secured between the casing and tube.

622,355. Electric Elevator. Thaddeus W. Heermans, Evanston, and Norman Whichello, Chicago, Ill. Application filed January 29, 1898.

In a controlling device for electric motors, a controller arm, a rotatable shaft, a plurality of arms having crank or eccentric connections with the shaft arranged to engage the arms for actuating the same and means for rotating the shaft are described.

622,369. Controlling Switch for Electric Motors. Reese Hutchison, Mobile, Ala. Application filed November 26, 1898.

The combination is described of an electric motor, a motor circuit therefor, means for varying the effective strength of current in the circuit, including a multiple contact switch, an automatic electromagnetic locking device for locking or holding the switch in any contact position, and means for mechanically disengaging the locking device.

622,392. Method of and Means for Operating Electric Motors. Charles J. Reed, Philadelphia, Pa. Application filed August 17, 1898.

The method of operating electric motors from a divided source of electrical energy consists in supplying the fields from a fixed number of the divisions of the source of energy at a constant electromotive force and supplying the armature from a variable number of the divisions of the source of energy at a variable electromotive force and in rotating the connections at frequent intervals in a fixed order of sequence.

622,398. Electric Steering Apparatus for Vessels. Gaston Sautter, Paris, France. Application filed November 17, 1898.

A transmitting apparatus, a series of commutators provided with magnetic relays or their equivalents controlled by the transmitting apparatus, an auxiliary motor, the circuit whereof is adapted to be opened and closed and its current reversed by the commutators and relays, a differential train of gearing controlled by the auxiliary motor, a rheostat and commutator controlled by the train of gearing and a principal motor controlled by the rheostat and commutator and directly controlling the rudder are described.

622,412. Telephone Cabinet and Support. Paul W. Bossart, Marietta, Pa. Application filed February 11, 1898.

A transmitter-supporting arm having its lower end recessed at one side and normally closed by a part of a fixed device to which it is attached is in combination with a spring contained within the recess and operating to lift the arm, a transmitter mouth-piece and a pivotal joint connecting the mouth-piece to the arm and allowing horizontal motion.

622,413. Granular Electrode and Process of Treating Same. Paul W. Bossart, Marietta, Pa. Application filed June 6, 1898.

A telephonic instrument has in circuit a body of non-metallic metal-coated granular electrodes which have projecting on a sides of their surfaces

622,430. Electric Elevator. Thaddeus W. Heer-

Western Electrician.

EVERY SATURDAY.

Vol. XXIV.

CHICAGO, APRIL 22, 1899.

No. 16

D. G. Hamilton, President Chicago City Railway Company.

The directors of the Chicago City Railway company have elected Mr. David Gilbert Hamilton president of that corporation to fill the vacancy caused by the death of the late M. K. Bowen. Mr. Hamilton was second vice-president of the company and a practical street-railway manager. He was familiar with the company's affairs and policy and had a large financial interest in the enterprise. For these reasons he was selected to succeed Mr. Bowen, and, as he was the only member of the board who was thus equipped, he consented to act, although his personal interests demand his attention.

Mr. Hamilton is a lawyer by profession, but he has been identified with street-railway interests so long that he is more widely known as a successful manager of transportation properties than through his legal connections. This may be due partly to the fact that he abandoned general practice early in his career and has since made a specialty of trusts, real estate and probate matters, in all of which he is a recognized authority. His advice in matters pertaining to investments is considered especially valuable by capitalists and his experience in organizing and conducting financial transactions of magnitude, as well as in the management of quasi-public enterprises, has gained for him the confidence of investors in this class of properties.

Mr. Hamilton was born in Chicago in 1842 and he completed his education in this city. He also entered upon the practice of his profession here and he has always been closely identified with the leading enterprises of the community. At times he has controlled large interests elsewhere, but he has always lived in Chicago and he has made this city the headquarters of all business interests that have been under his management. He has seen the city constantly changing, growing and extending its influence, and he has great faith in its future.

Mr. Hamilton's family occupied a position of prominence and influence, and the young man had many advantages for those days. His father was a successful contractor, and gave him an excellent education as a foundation for his business career. The young man was first placed in a private school, then passed through the high school of the city and entered Asbury University, now De Pauw, at Greencastle, Ind., where he completed his course in 1865. He rounded out his studies by a special course at the law school of the old Chicago University, from which he was graduated in 1867. He at once established himself in Chicago, where he devoted himself to the practice of the law. He abandoned general practice after a year, and from that time made a specialty of trusts, real estate and probate practice.

During the last 15 years he has been actively engaged in the management and operation of street-railway properties, and he has had valuable experience in the building and equipment of some of the most important street-railway enterprises in the country.

When he became actively interested in the Chicago City Railway company, 15 years ago, that property was comparatively insignificant; the cable had not been introduced and electricity was still an unknown factor. The old horse lines were restricted, and the development of the industry seemed to have come to a standstill. But improved methods of operation were introduced—first the cable and then the electric motor—and with mechanical propulsion assured street-railway interests assumed an importance in the financial world that had not been dreamed of by the most enthusiastic advocate of the new order.

For five years Mr. Hamilton devoted considerable attention to the affairs of the South Side system. He was a director during that important period in the company's history and gained valuable experience in the management of street-railway properties during that time.

Ten years ago, in company with other Chicago

capitalists, Mr. Hamilton formed the National Railway company of St. Louis, which has since proved such an important factor in the transportation affairs of that community. The object of this organization was to acquire and operate street-railway properties. Mr. Hamilton was elected director at the time of organization, and at the next meeting he was chosen president. He continued at the head of the company until January 25th of the present year, when he relinquished control of the property. For 10 years the "Hamilton syndicate," as the company was called, engaged in the development of street-railway business in St. Louis. It absorbed the Citizens' Railway company, Cass Avenue and Fair Grounds Railway company, with which the Northern Central Railway company and the Union Railroad company were consolidated, the St. Louis Railroad company, the Southwestern Railway company and the Baden and St. Louis Railroad company. Mr. Hamilton was president of each of



D. G. HAMILTON.

these companies, as well as the National company, but he continued to reside in Chicago, and the offices of the corporations were in this city.

The system controlled by the Hamilton syndicate in St. Louis was extended and completely rebuilt during Mr. Hamilton's administration, and the value of the property increased every year. It was considered one of the best street-railway investments in the country, which was of itself a high compliment to Mr. Hamilton's management and administrative ability.

Recently Mr. Hamilton was induced to return to the directory of the Chicago City Railway company and he had been elected second vice-president at the January meeting. His familiarity with the affairs of the company and his experience in the management of this class of properties make his services very valuable at this juncture.

Aside from his professional work and his street-railway interests, Mr. Hamilton has many important financial connections, and he is engaged in other enterprises that occupy much of his time. He is resident director of the Union Mutual Life Insurance company of Maine, director of the Title and Trust company of Chicago, director of the National Bank of Texas and is interested in other enterprises. He has always encouraged educational institutions and has devoted much of his time to

this work, especially the University of Chicago and the De Pauw University at Greencastle, Ind., in both of which organizations he is a member of the board of trustees.

Mr. Hamilton is a member of the Chicago club, the Union League club and the Washington Park club, as well as many purely social organizations, but he gives very little time to club matters and has never taken an active part in their management or direction. Mr. Hamilton resides at 2929 Michigan avenue.

Talk of Street-railway Consolidations.

Within the last few weeks the talk of consolidating the principal surface street-railway systems of Chicago has been revived to some extent. It is said that Mr. Yerkes is willing to merge the North and West Side companies into the combination, but that the stockholders of the Chicago City Railway company on the South Side are unwilling to surrender their property, even though a price of 400 be fixed on the stock, compared with 300 for North Chicago and 125 for West Chicago. Representatives of the Whitney-Widener-Elkins group of capitalists were in Chicago last week, and the newspapers had much to say about the possible consolidation of the street-railway interests of Chicago at their hands. However, it is more likely that the visitors came to further the interests of the new Illinois Electric Vehicle company exclusively; and the suggestion that the street railways may be absorbed to avoid conflict with the proposed system of electric vehicles seems exceedingly far-fetched. On the whole, the combination of the three principal surface street-railway systems of Chicago seems remote. It is possible, however, that the Yerkes companies may be united into one by eastern capitalists and that Mr. Yerkes may retire from the street-railway field in Chicago.

This is a Philadelphia dispatch, dated April 15th, to the New York Sun: "Capitalists of this city are engaged in forming a combination for the control of all the electric traction companies in Pennsylvania outside of Philadelphia. The concern is to be called the Electric Traction company of America, and it is to be capitalized at \$25,000,000. The par value of the stock is to be \$50 a share, \$5 of which is to be paid in at once. Among those said to be prominently identified with the movement are John Lowber Welsh, Silas W. Pettit, W. H. Shelmerdine and former Mayor Warwick. The head office of the company is to be in Philadelphia. The scheme is entirely local in so far as those interested are concerned, but the presidency of the company will go to A. A. McLeod, formerly president of the Philadelphia and Reading railroad. The various trolley companies throughout the state have been carefully looked into and data prepared showing the capitalization of each, with prospects for extensions and increased earnings. It was said authoritatively this afternoon that Mr. McLeod had consented to accept the presidency of the company."

Canadian Niagara Project.

[From the Ottawa correspondent of the Western Electrician.]

The Ontario government and the Canadian Niagara Power company have come to an agreement by which the company has decided to relinquish its monopoly before November 1st next. The agreement provides that the company may continue to do business, but the monopoly clause will be stricken out. A second company is negotiating with the government, and has about arrived at a definite agreement, the details alone not being arranged, but when they are it will commence work at once.

At a public meeting held in Nephi, Utah, recently, it was decided that the town should have an electric-lighting system.

Repairing Electrical Machinery.

By B. F. FELLOs.

Recently the bearings of one side of a dynamo shaft indicated by a rattling sound that something had given out. The bearing is presented in section in Fig. 1. It carries the cylinder connection A. The cup encircles shaft B, and attached to this cup are the studs H H, which are bored out for the shaft G and spiral spring I. The bearing is of the three-point description, and is designed so that all three points of the contact D D on the cone E, and on the cups, present a free rolling surface. The difficulty is that the end pressure from the center of the shaft at C, against the balls and points of contact F F, results in a partial sliding motion at times, and this produces friction. In this particular case the cone was found to be broken at J, over the key K. It was fixed by turning of a shoulder, as at L, Fig. 2, and upon this was shrunk a steel collar M, Fig. 3. This collar or ring made the cone perfectly tight. To have a cone made to replace a broken one, draw out the shape. This will give the makers a general idea of what is wanted. If it is desired to send measurements in detail, obtain a proper length from base to point. This is obtained by measuring the length in the pinion which is to be driven by it. It is important that both shall correspond in length. After the cones are reduced to their proper length, the pitch line is found.

There is a factor connected with the use of cone bearings of electrical machinery which should be considered, and that is the coefficient of friction. Now a coefficient is simply a quotient, and in this case is simply a number that is determined upon by experiment; it shows the relation the surfaces bear to the weight pressed upon them. Thus, if a block of iron were laid on the table it would require a certain amount of force to drag it along the table, but if the table were oiled and the same block put on it would require less force to start it. The proportion that this force bore to the weight would be called the coefficient of friction. If it took a force of 25 pounds to move a block of 50 pounds' weight on a certain surface, the coefficient would be .50, and if it took but a force of 10 pounds to move it the coefficient would be .20, and multiplying the weight by the coefficient will give the force to overcome the friction. The lower the coefficient of friction is, then the easier it will be to drag an object and the less the friction. Friction depends on pressure, not extent of surface, and the block may be set up edgewise, but its weight being the same, the friction will not change. The force with which one surface presses upon another surface varies with the weight or pressure of the pressing surface, and the friction will be this pressure or weight, multiplied by the coefficient of friction.

ANGLE OF CONES INCORRECT.

Some of the lighter designs of electrical machines are supplied with ball bearing of the pattern shown in Fig. 4. The trouble with these types of bearings is that the thrust contact, combined with the roller contact, cannot work well with any oil when the cone is shaped to an angle of only about 28 degrees to the angle of the force acting upon it. This is sketched in Fig. 4, in which the shaft center is A, and the lines of contact of the balls C to B. The pressure often causes the set-screw to cut a groove around the shaft as at D, Fig. 5. It will not do to remedy this with a sharp-pointed set-screw, like Fig. 6, for this will cut the shaft still more, nor will a flat point, like Fig. 7, do, for this will not grip well and will slip. The medium between the two may be used, as in Fig. 8. Such a point can be screwed firmly to its seat on the shaft and usually hold permanently. On the old style of motor driving we often had difficulty with the gearing in getting a good mesh, and in getting the requisite firmness. Much skill was required in setting, if there ever was occasion to make alterations and repairs. Oftentimes a new set of gearing has been put on and permanently good results have been looked for; but the operator has been sometimes disappointed in finding the gear worn out in a few months. Of course, this was due to improper fitting. I always found it a job that required thoroughness and patience and considerable skill, withal, to fit the gearing and shafting and bearings, so that each one supported the other. A common difficulty is encountered in endeavoring to make the driving gear run perfectly true on the shaft. If the gear were the least bit out on the shaft it would wobble a good deal when one came to try out to the rim. And when it is considered that the pinion is on the side of the rim, and not on the outer edge of it, it is realized that the defect is a serious one. A pinion cannot run in an elliptic. It must be concentric with the source of movement at all points in its revolution. Any deviation from its course, from whatever cause, by which the source of power is placed at a variable distance during its revolution, will produce an unsteady movement in the pinion, which occasions undue strain. The ring being tipped out of level, or being level and not concentric with the shaft, are conditions that need close attention. In such states a periodical changing of the pinion is not a commendable a practice as its removal. Ping sometimes are not concentric with the shaft, owing to the pin on the top of the lifting ring being broken off. This pin keeps the rail steady and in its proper place. Its absence will permit the rings to get out of their normal position. Attendants should be instructed to keep a lookout for this accident, as it is liable to occur unnoticed.

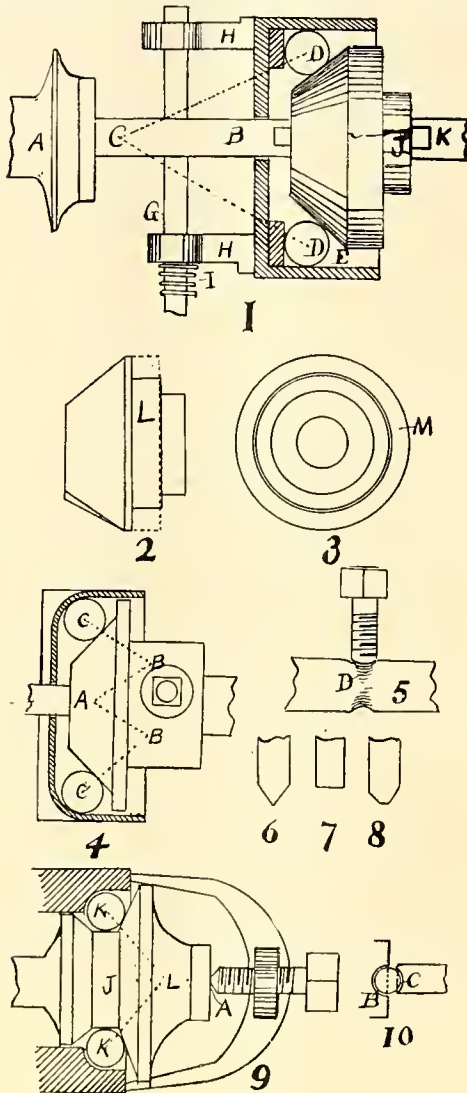
ants should be instructed to keep a lookout for this accident, as it is liable to occur unnoticed.

STRAIGHT BEARING.

In Fig. 9 is a pattern of so-called "straight" bearing which the writer has noticed on some electrical machine shafts. The pressure of the balls and cups is about evenly distributed from K K to L, so that the forces do not contribute to any irregularity in the weight. The balls touch the sides of the cone flanges evenly, and there is opportunity for the oils to work. In one case which came to my notice the end of the shaft was gauged with a set-screw at A. The work was not perfectly performed and the pointed screw was heated, the temper drawn, and then a ball-cup end was formed for the steel ball C, Fig. 10. The end of the cone shaft was then cupped to receive the ball, resulting in a ball-socket union at B.

MAKING A CYLINDER TRUE.

If the cylinder is of the common style which screws onto a straight shaft, the work of turning down the rim can be easily accomplished by putting the cylinder and shaft in the lathe together.



REPAIRING ELECTRICAL MACHINERY.

When the cylinder is held in the lathe it can be turned off on both sides without removing and can be accurately trued as far as side lines are concerned before the turning is started. A few blows with a rawhide mallet will cause the cylinder gear to run true, no matter how badly out of true its rim was before putting in the lathe. The lathe cutting-tool will then take off equal quantities of metal from all points around the rim.

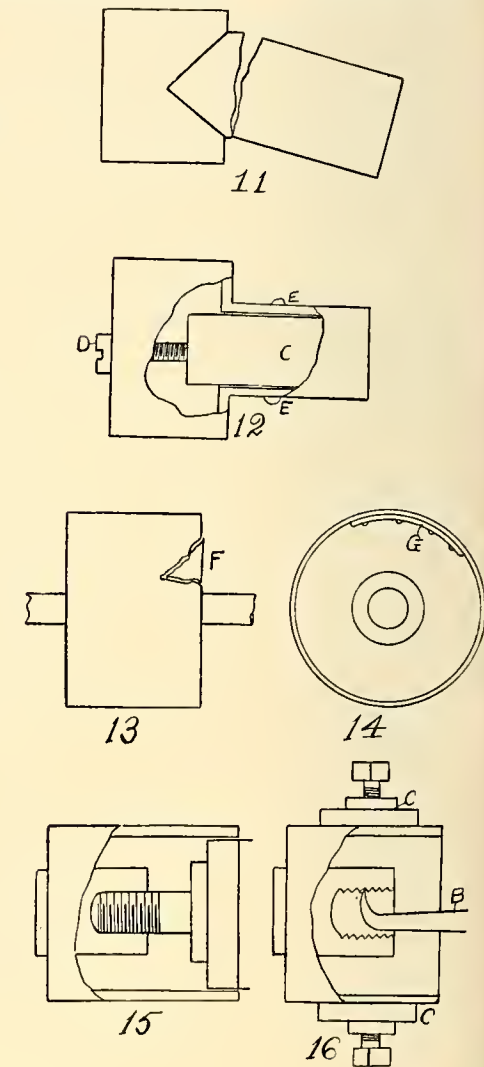
ROUND DRIVING STRAPS.

Round driving straps of dynamos and motors are subject to strain, and often wear out rapidly, even when the most improved devices are used. These straps are generally made of leather, but even when the best leather is used their life is short, and they are a source of loss by causing stoppage of the machine while replacing broken with new ones. Numerous substitutes for leather have been placed on the market of late years, one of the best of which is made of canvas, saturated with cement, and folded until the proper thickness is reached. This blank is then pressed into nearly a U-shape, except that the sides near the ends are nearer together than they are at the bottom. Both sides are parallel, the variation in the distance apart being effected by bending the sides inward, so as to form a jog near the middle. The object of this shape is to allow the

looped part to have a curved thickened interior, so as to better resist the wear.

MOTOR CONNECTIONS.

Broken connections about the motor, safety fuses blown, fractured joints, etc., are among the principal causes of a motor failing to start after the current has been turned on. If the connections are found to be loose it is a simple matter to tighten them. In case of wear or breakage, some repair work will be necessary. It would be out of place to give directions as to how bearing rolls should be covered, as electricians often differ as to how and with what they should be covered. Whatever it is, have it well done. See that there are no ridges at the edge of the covering and that the laps are made straight and even. Also see that they are put on so that they will not run against the lap when they are in the frame. It is also important that they be kept clean. Keep all the driving bands tight. All the hands should be composed of two strands, the first strand to be twisted separately, in order that when the strands are doubled, and the second, or cable-laid twist, is put in, the band will form a loop at one end, and be long enough at the other to allow



one of the strands to be unwound a little, put through the loop, when both ends are tied in a square knot. A knot of this description is no larger in bulk than the diameter of the band, and when put on and tied in good shape the knot will last as long and wear as well as the rest of the band.

REPAIRING A BROKEN FRAME JOINT.

I recently repaired a fractured motor-frame joint on the plans shown in Figs. 11 and 12. Fig. 11 shows the character of the break. Fig. 12 shows the method of repair, which consists in putting in a cast piece C set-screwed at D and riveted at E E. By properly proportioning rivet and plate area, a joint may be made to have 85 per cent. of strength of the solid piece.

Circumferential seams should be double riveted, not so much as a measure of strength to resist pressure, but to better resist the strains and shocks received by motors in service. Every rivet should be driven by power. It is becoming possible to thus drive a greater proportion owing to the improvement in machinery for the purpose, the latest style riveters having a greater reach and scope. There are several of the smaller portable machines for special parts. One of these is especially recommended for closing the rivets in the ring. By using such an appliance a rivet longer than could be closed by hand

may be driven and will leave no larger head, the extra length having been forced into the long hole, completely filling it. The head is also changed in shape by the holding-in die, which forces part of the metal from the head into the hole, making both ends equally to be relied on for tightness.

BROKEN PULLEY.

In one shop they could not get good work from a motor, owing to the condition of a driving pulley, which was broken, as in Fig. 13. A piece was broken out at F. Fig. 14 shows how this was repaired by putting a patch G on the inside and fastening with rivets.

Patches may be divided into two principal kinds; that is, hard patches and soft. There is no difference in the material which is put on in either of these

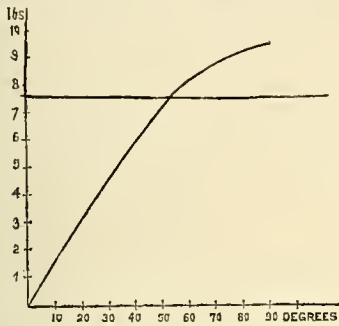


FIG. 2. THE BALANCING OF ARMATURES.

kinds; the only difference is in the method of applying. Both the hard and soft patches, therefore, may be made of iron or steel, as is most convenient. The hard patch is put on and riveted. The soft patch is put on with bolts, which are tapped; passing through and screwing up all the bolts is what holds the patch in place, in place of the rivets used for the hard patch. It is better to drill the holes than to punch them, although some men use a portable screw punch for this purpose, also for punching the holes.

CARE OF UNUSED MACHINES.

Electrical machinery is often kept in damp places and frequently stands idle for months. Probably as good a way as any is to wipe exposed metal parts with vaseline and cover with a cloth to keep off dust. The parts should be thoroughly cleaned before using, as oil and lubricant will gum. In some classes of metal work it is the custom to cover exposed surfaces with a species of paint as a protection. This is made by dissolving a wax candle in spirits of turpentine and painting the iron or steel. Such an application to a motor or dynamo would be cleaner than vaseline, and would be likely to work well. When electrical machinery is to stand idle for a considerable time, and it is not advisable to cover the bright parts with white lead or other rust-proof paint, protection might be given by boxing up the machinery as closely as possible.

RUBBER INSULATION.

For greasy insulation that is old and will not stick a mixture of 1½ pounds of resin, two pounds of oil of turpentine, two pounds of india-rubber cut into small pieces, six pounds of fish oil and two pounds of tallow is recommended as an adhesive agent. The pieces of rubber are placed in an iron pot and warmed

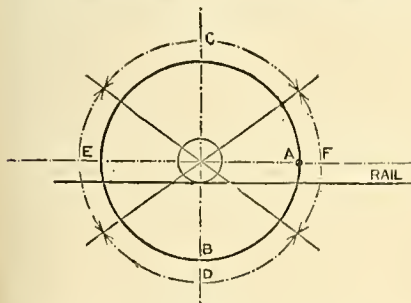


FIG. 1. THE BALANCING OF ARMATURES.

to a temperature of 122 degrees. When the rubber is dissolved add the resin, and when this is dissolved, the wax. Fish oil and tallow are melted in a separate vessel, and after slightly warming both portions they are mixed with diligent stirring, which is continued until the mass is cold, when it may be used.

CUTTING INSIDE THREADS.

The inner threading of a compound barrel joint was in bad condition, as shown in Fig. 15, and it was necessary to either put in a new case or recut the threads in the old one. Several repairmen were approached, but could do nothing until a new case was secured. It seems that none was available, and a machinist added to his reputation by recutting the threads in the old case with a cutting tool B, Fig. 16, holding the case in the chuck plate on the lathe by use of the arrangement C. This indicates what one may do if he only has the tools and machinery to work with. The cutting tool is pro-

vided with a V-shaped tip, which should be well hardened and close ground.

GLUING RUBBER INSULATION.

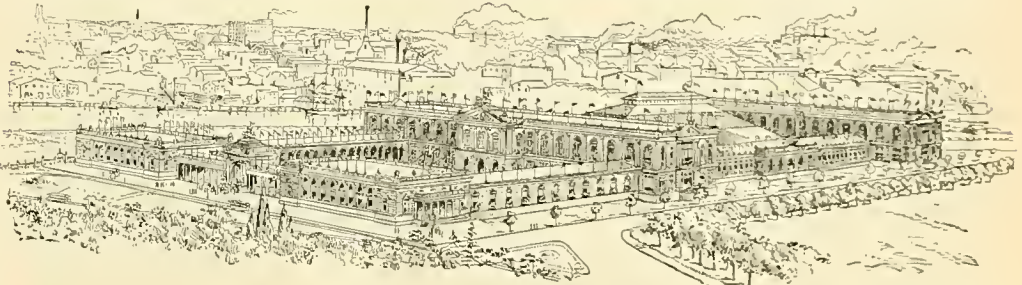
The following receipts for gluing rubber are of service: First—Equal parts of gelatin and isinglass are for 10 hours steeped in water and then boiled with tannin to the consistency of dough. The surface to be glued must be carefully cleaned before applying the warm glue. Second—One pound gutta-percha, cut into small pieces, is (in a water bath) heated in 10 pounds of benzol until completely dissolved. Linseed-oil varnish, up to two pounds, is added next.

Philadelphia Exposition.

The promoters of the Philadelphia Exposition, which will open on September 14th and continue until November 30th, are encouraged by the interest displayed by leading manufacturers of all lines of machinery and articles for export trade in the exhibition. It is the purpose to exhibit every line of manufactured products of the United States especially suitable for export. These exhibits will form the principal department of the exposition, and will comprise everything which is, can or might be exported, from locomotives and heavy machinery to the smallest novelties.

No foreign manufacturers will be permitted to exhibit, but arrangements have been made for a department of foreign manufactures, which will consist of collections of samples of goods made in the commercial countries of Europe and successfully sold in all foreign markets in competition with American goods, and in foreign markets in which American trade has not yet been developed. These samples will be exhibited side by side with American products of the same class, and will show manufacturers just what competition they must meet abroad, as well as the peculiarities in the demands of foreign markets. The samples of goods of foreign manufacture are being selected and purchased abroad by representatives of the exposition, aided by the entire consular service of the United States.

A third department will show how American goods



PHILADELPHIA EXPOSITION.—MAIN BUILDING.

must be packed, labeled and shipped in order to meet the requirements of foreign trade, which vary according to the degree of development or civilization in each country of the world.

As has already been announced, the exposition will be under the joint auspices of the Philadelphia Commercial Museum and the Franklin Institute. The board of directors of the Philadelphia Exposition association includes a number of the most prominent and energetic business men of Philadelphia.

Congress appropriated \$350,000 to aid it. The city of Philadelphia has given \$200,000 and the state of Pennsylvania \$50,000, and \$100,000 is being raised in Philadelphia by individual subscriptions. A bill now pending in the Legislature of Pennsylvania appropriates \$200,000 more, making a total exposition fund of about \$900,000.

The main buildings, which are now under construction, cover eight acres of ground, and the available exhibition space will be at least 200,000 square feet. Outside of the space occupied by the erection of detached structures for special exhibits within the exposition grounds, which comprise a tract of 56 acres of land on the bank of the Schuylkill River, within 15 minutes' ride of the city hall. There will be a large area for amusement features, which promise to be as unique and interesting as the exposition is practical.

Assumption of Risk in Passing Rope Under Wires.

In a personal injury case it appeared that the plaintiff, while in the employment of the defendant company as a lineman in placing wires, was injured by an electric shock, caused by coming in contact with wires heavily charged with electricity. At the time he was under the control of a foreman who was in charge of the work in which they were engaged; and in his petition he alleged that he was commanded by the foreman to pass the rope he was then using with which to handle the wires under two primary electric-light wires, and in doing so, while exercising due care, he received the shock from which the injuries resulted.

The trial judge directed a verdict for the defendant company. He instructed the jury that there were two reasons why the plaintiff could not recover damages upon the facts which he had testified to be true: First, because it clearly appeared from the

testimony that the act of passing the rope and wires under the electric wire, which he was instructed to do, was not necessarily dangerous, but only so if the person passing them under should come in contact with the wires, which he would be supposed to avoid in the exercise of due care. Hence, there was no negligence in directing this to be done, or, if there was, it was not the proximate cause of injury to the plaintiff; the proximate cause of injury being the act of the plaintiff in accidentally or negligently coming in contact with the wire. Second, it appeared from the plaintiff's testimony that he understood the probable danger of coming in contact with the wires; and if there was necessarily danger of coming in contact with them involved in passing the rope and wire he held under the electric wires, he must be held to have assumed the risk, and he could not excuse his thus going into known danger because instructed so to do by the agent of the defendant company.

The case having been taken up to the Court of Civil Appeals of Texas, the latter expresses the opinion that the judge took the correct view of the evidence, and it holds (Newnom against Southwestern Telegraph and Telephone company, November, 1898) that, such being the case, it was proper for the judge to instruct the jury to return a verdict in favor of the defendant.

The Balancing of Armatures.¹

BY CLAUDE W. HILL.

In these days of drum armatures with turned cores, accurately planed or milled slots, and symmetrically formed windings, the amount of balance obtained in the ordinary course of manufacture is quite sufficient for the moderate speeds of revolution generally in use. Occasionally, however, we have to construct machines to run at unusually high speeds, and then it becomes necessary to test the balance of the armatures and attach counterweights if required.

The usual method of testing the balance of an armature is to place it upon level parallel straight edges, when the heavy side is supposed to sink

to the bottom, and counterweights are then attached to the opposite side of the armature until it will remain at rest in any position on the rails. In practice the writer has found this method unreliable and unsatisfactory, and the following figures will show the reason:

Fig. 1 represents an armature 16½ inches diameter, weighing 10 hundredweight, and intended to run at 750 revolutions per minute. We will assume that it is out of balance to an amount equal to a weight of two pounds at the periphery on one side. When this weight is at the position A, it will tend to sink to the position B, and in doing so will exert a diminishing horizontal tractive force tending to roll the armature along the straight edges. The amount of the tractive force exerted at each point from B to A is shown on the curve, Fig. 2. The force necessary to produce movement of the armature is shown by the horizontal line drawn on the curve, and we see that this line cuts the curve at 53°. Laying this out on Fig. 1, we see then that within the arcs C and D the weight of two pounds is insufficient to produce any movement of the armature, while within the arcs E and F the movement will be comparatively feeble and uncertain, especially if the armature has been running in the machine and the shaft has become slightly magnetized. By this method of testing this armature would therefore appear to be in sufficiently good balance. Upon being placed in the machine and run, however, the centrifugal force due to the unbalanced weight would be 26½ pounds, which would be sufficient to cause considerable vibration, and possibly sparking and breakage of commutator connections.

A more sensitive way of testing is to place the armature on anti-friction wheels, themselves running on ball bearings. The heavy side of the armature would then fall much nearer to the zero position, although there would still be sufficient friction to prevent it getting quite there.

The best plan is to test with that force which it is our object to compensate; that is to say, the centrifugal force itself. To do this the armature should be mounted in bearings which are free to move, then while the armature is running the heavy side can be found with a piece of chalk and counterweights adjusted on the opposite side until the cessation of movement of the bearings shows that the center of gravity coincides with the axis of the shaft.

1. From the London Electrical Review.

Electrically Driven Temperley Transporter.

The Temperley transporter was first introduced in 1893, when the portable beam type was tried with marked success by the British admiralty for coaling men-of-war during the naval maneuvers of that year. Since then these transporters have been much used for this purpose by the British government, and they have been applied in a variety of new forms for use on shore, where they are found to offer many advantages, especially when a long overreach is necessary and goods have to be conveyed to a considerable distance from the lifting point.

The special feature of the Temperley transporter is a pulley carriage or traveler of novel design, working on an elevated track, and provided with a simple automatic device by which the traveler is arrested and held stationary while a load is being lifted or lowered, and which sustains the load while the traveler is moving.

The operations of lifting, transporting and lowering the load are effected by the simple action of hauling in and paying out a single rope, and any ordinary form of winch may therefore be used for working the transporter.

The travelers are made in several sizes and patterns and are adapted to work on beams and other forms of track, either inclined or horizontal. Hitherto the transporters have been steam driven, but electricity has found its way into favor for this purpose. The first electrically driven tower transporter has been supplied to the London Lead Smelting company at Millwall. The accompanying illustrations of this installation are reproduced from the Iron and Coal Trades Review of London. In the background (Fig. 1) are two horizontal warehouse transporters, one with the arm over the river hinged up vertically, and the other with the arm in a horizontal position overhanging the water. It will be observed that the

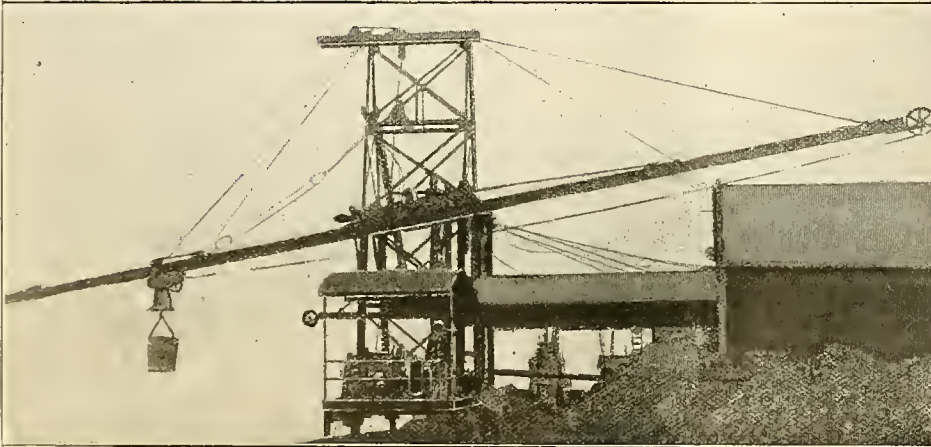


FIG. 1. ELECTRICALLY DRIVEN TEMPERLEY TRANSPORTER.—GENERAL VIEW.

transporter in the foreground consists of a traveling tower, which can be moved along the rails and placed in front of any vessel or lighter lying at the quay, and is provided with a transporter beam 68 feet long. The projecting arms of the transporter overhang the water for 30 feet and the quay 30 feet, the gauge of the rails and the width of the tower being eight feet. The arm over the water is made to hinge up when not in use.

The driving machinery has heretofore been somewhat cumbersome, consisting of a boiler and engine, but in the present case this apparatus is replaced by an electric motor, carried on the lower part of the traveling frame, which is covered in to form the house. An enlarged view of the machinery is given in Fig. 2, p. 227. The floor forms a platform from which the driver has a clear view into the lighter. The buckets, after being lifted from the lighter by the transporter, travel along the beam at a speed of 300 feet per minute. The buckets can be automatically dumped at any desired point without touching the ground, but as close to the ground or the heap of material as desired, so as to avoid the breakage of coal or other material. The motor is then reversed, and the empty bucket is returned to the lighter at an equal speed. The average capacity of the apparatus is 30 to 60 tons per hour, according to the load lifted. The transporter is principally used for unloading coal, coke, limestone and ore from lighters.

The electrical equipment consists of a motor, which is geared directly to the transporter winch. It is the C.B. 200 railway type, which is used for crane and hoist work. The nominal capacity of this particular motor is 12 horse power when running at 250 revolutions per minute, but it is capable of giving over double this capacity when necessary. It is series-wound and is supplied from a 220-volt circuit. The controller is the British Thomson-Houston standard P. 13, with magnetic blow-out, by means of which the deleterious effects from the burning of the contacts by the arc formed at the moment of opening the circuit are prevented. This controller is capable of regulating the motor so that different speeds can be obtained in either direction. There is only one handle, movement of

which in one direction gives "forward rotation" of the motor, and the other direction "reversed motion" of the motor.

The electric equipment is considered a great improvement over the original style of apparatus.

Electricity in South Africa.

[Prepared for the Western Electrician by the Philadelphia Commercial Museum.]

The attention being given to the development of the coal measures of South Africa implies a demand in the immediate future for mining apparatus, and electrical appliances should, in consequence, come into request. Electric-light installations have not yet been established outside of a few important centers, and the development of existing street-car lines and the construction of new roads are being considered. In Durban, the chief city and port of Natal, the question of the ownership of the street horse-car lines, for some time in dispute between the municipality and the operating company, only awaits settlement to bring about the adoption of electric power. On the Rand the authorities have been coquetting with the question of establishing electric-light and power stations for some time, but there is now promise of a more general use of the force in Johannesburg, Pretoria and elsewhere. A correspondent at Cape Town writes that there is a general disposition throughout the country (South Africa generally) to adopt the electric system of lighting.

American manufacturers of electric appliances have been represented in the South African field of late years, and particular attention has been given to the machinery market, but the proportion of the business which falls to the American houses is much smaller than might be expected, judging from the ability of American makers to fill the requirements. No separate classification is made

power Otto cycle gas engine, a drum dynamo, water tank, gas-bag, etc., all fitted on a single cast-iron base, ready to be set in working as soon as delivered. The dynamo has inverted pole-pieces, and is capable of lighting 15 16 candle power, or 30 eight candle power lamps, or of charging accumulators. It is fitted on slide rails, which allow of the belt being tightened while the dynamo is running. The engine has tube ignition, piston, detachable water-jacket, sensitive governor and is provided with two heavy flywheels. A supply of gas is secured at a cost of three-fourths of a penny (English) an hour.

A correspondent at Cape Town writes that a line of goods which would find a market is electrical apparatus—bells and lighting. Electrical pumps are largely used at Johannesburg, Transvaal, for pumping water from the dams to the mills. So far, the principal makers have been Gwynne, Easton & Anderson and Hayward Tyler, all English makers, the design being three-throw ram pumps, with helical gearing belts, driven from the motors, and capable of delivering 20,000 gallons per hour.

Correspondents of the Philadelphia Commercial Museum agree that the business prospects are better than they have been, and it is thought that a period of greater prosperity is dawning. The period of political and commercial unrest appears to be passing, and trade is undoubtedly improving. Adequate representation is essential to the development and successful issue of South African business. It should be noted, too, that the tendency of American manufacturers to sell direct to the wholesaler or retailer, rather than through a commission house, is reflected in the foreign market, where traders are exhibiting a desire to open up trade relations with manufacturers, to the exclusion of "middlemen."

Motor-carriage Exposition at Berlin.

An international competitive exhibition of motor-carriages will be held at Berlin in September, and as a general invitation to all manufacturers of this style of equipment has been issued, American makers of electric vehicles will doubtless be interested in the following particulars, which are summarized from a recent report of Frank H. Mason, consul-general at Berlin:

The exposition will be held in a covered building, known as the Exercier-Haus, 34 and 35 Karl strasse, and will be open daily from 10 a. m. to 6 p. m. The rent of exhibition space will be as follows: For the first 25 square meters of ground or wall space, \$2.38 per square meter; for the second 25 square meters, \$1.90 per square meter; for the third 25 square meters, \$1.42 per square meter, and for all additional space accorded to one exhibitor, 90 cents per square meter. The committee reserves the right to reject any article offered for exhibition, but the applicant will be immediately notified of its decision. Each exhibitor will be required to furnish for the catalogue, not later than August 1st, two photographs or photographic plates representing his exhibit. Possession of exhibition space will be given to exhibitors on the morning of September 1st, and articles for exhibition must be in place and ready for exhibition by ten o'clock on the morning of September 3d. During the hours of exhibition, the exhibits shall not be covered, but remain open for public inspection, and may not be withdrawn during the continuance of the exposition, except with the consent of the committee of management. All exhibits are to be withdrawn and taken possession of by the owner within 24 hours after the close of the exposition.

The price of admission to visitors is fixed at 47.6 cents on the opening day, and during other days from 11.9 to 23.8 cents; season tickets, \$1.19 each. Exhibitors, their employes and agents, will receive non-transferable tickets, good during the exposition, for the nominal price of 23.8 cents.

Exhibits will be classified as follows:

- (a) Motor carriages and devices of all kinds for the transport of persons.
- (b) Motor wagons for transport of freight.
- (c) Motor cycles and trailers.
- (d) Motors and accumulators for motor carriages.
- (e) Parts and wheels for motor carriages.
- (f) All articles relating to motor carriages and not otherwise classified.

Not more than two examples of the same class will be permitted to each exhibitor. A progressive series of tests, races, etc., is in contemplation, the programme for which will be announced by the committee of management at the opening of the exhibition. Neither prizes nor medals will be given. The advantage to exhibitors will be confined to the results of the competitive tests, which will be related in detail in the report of the committee.

Water Power in Ottawa Valley.

[Special correspondence of the Western Electrician.]

Mr. Andrew Holland of Ottawa has prepared an estimate of the various water powers in the Ottawa Valley. His calculation is as follows: Ottawa River, 664,000 horse power; Rideau River, 1,300 horse power; Mississippi River, 14,700 horse power; Madawaska River, 20,600 horse power; Bonnechere River, 3,400 horse power; Petit Nation, 2,000 horse power; Blanche River, 2,000 horse power; Lievres River, 98,450 horse power; Little Blanche, 300 horse power; Quyon River, 100 horse power; Coulonge River, 27,600 horse power; Black River, 2,000 horse power; Gatineau River, 31,675 horse power, making a total volume of estimated power of 890,225 horse power.

Detroit Street-railway Situation.

The Detroit correspondent of the Western Electrician says that the proposed purchase of the street railways of Detroit will be consummated in a few weeks, as soon as the appraisers bring in their reports. In the meantime Governor Pingree is holding open meetings in various parts of the city to educate the people on the importance of the transaction. Prominent speakers are in attendance to answer all questions put to them tending to clear the public mind.

Mayor George T. Marks of Port Arthur, Ont., the only city in this country, so far as known, enjoying municipal control of street railways, visited Detroit, and in an interview on the problem said, in part: "Eight-for-a-quarter tickets are sold, for use morning and evening, while during the day the rate is six-for-a-quarter. Despite the fact that we have a population of only about 7,000 to draw on, the roads pay the municipality 2½ per cent. profit. In connection with the road the city of Port Arthur owns its own electric-light plant, and a flat rate of 22½ cents per month per 16 candle power incandescent light is charged. Meter rates are eight cents per 1,000 watts. Our investment is \$130,000. The income is not sufficient to pay the interest on the bonds, but the people would not have the plant sold to a private concern for anything."

Another feature of the case is presented in a dispatch to the Chicago Record: "The most important matter under consideration with Governor Pingree's municipal-ownership commission is the securing of a security franchise. That franchise to secure a 30-year extension of the present ones is now in the hands of Judge Speed and will be sent to the council. Its terms provide for a universal transfer system and a six-for-a-quarter ticket rate of fare. Governor Pingree and other members of the commission have maintained from the first that it was the intention of the McLeod bill to purchase the roads only on the consideration that the earnings would pay all operating expenses and fixed charges and create a sinking fund of a sufficient sum to release all bonds at the end of the average life of the present franchises, which is about 15 years. Now, however, it is conceded that there is doubt that this can be done, and it is admitted by Judge Speed that the bonds will be for 30 years at four per cent. In other words, the commission contemplates an extension of credit of 15 years. This is vigorously opposed, and the council will undoubtedly reject it on the ground that if the purchase of the street railways is not made and this three-cent fare is not agreed upon it will result in the people paying over \$10,000,000 more for rides on street-cars during the coming 10 years."

Canadian Power Transmission Project.

[Ottawa, Ont., Correspondent of the Western Electrician.]

The Bedford Electric company of Halifax, N. S., proposes to install an electric plant at St. Margaret's Bay to transmit light and power to Halifax and other points in the vicinity and to furnish power for the operation of an extensive pulp mill to be erected. The transmission line will be 18 miles in length and the pipe line from the power house to the dam about 4,000 feet in length. It is also proposed to operate an electric tramway to Halifax.

The Canadian General Electric company has been awarded by the Department of Railways and Canals the contract for the erection of a power house and the complete equipment of the Soulanges Canal with electrical apparatus for operating the locks by means of electric motors. The entire canal, covering a distance of 14 miles, will be illuminated by arc lamps. Owing to the success met with in the operation of electricity at the canal at Sault Ste. Marie, Ont., as applied to the locks, the department decided to make a more extensive application of its use in the illumination and electrical operation of the locks of the Soulanges Canal.

Mr. J. R. Booth of Ottawa has closed a contract with the Canadian General Electric company, Toronto, by the fulfillment of which the machine shops and new car works of the Canada Atlantic railway in Ottawa will be supplied with electrical power generated from the Chaudiere Falls at the west end of the city. The electric company will install two three-phase generators, each of which will be of 200 horse power capacity. The power will be transmitted to the works, three and a half miles distant, by an overhead line. Besides furnishing power for the car works and the machine shops, this energy will operate the locomotive transfer tables, the traveling cranes and the entire lighting system of the different works and adjoining yards.

The Quebec Electric Railway company is busy making arrangements for applying electricity this spring to the whole 60 miles of its road. At present it employs electricity only in the city of Quebec. During the year it is to be applied also to the railway to La Bonne Ste. Anne. It has already sold a number of the old cars that were in use on that road, and new ones have been received from Ottawa to replace them. The right-of-way has also been acquired for the new road to be built and operated by the company from Quebec to the Falls of Montmorency, parallel with the turnpike road, through the village of Beauport. A good portion of the \$7,500,000 of new bonds issued by the company will be used in these works.

Wireless Telegraphy Anticipated.

[London correspondence of the New York Sun.]

Somebody has dug up from a copy of the Spectator 188 years old a curious bit of prophecy or prophetic imagination that gives the idea of wireless telegraphy in a guise which, while not scientific, does approach marvelously close to the present fact, when it is considered that in 1711 electricity and magnetism were practically unknown. This is the passage:

Strada in one of his Proleusions gives an account of a chimerical correspondence between two friends, by the help of a certain loadstone, which had such virtue in it that if it touched two several needles, when one of the needles so touched began to move, the other, though at never so great a distance, moved at the same time and in the same manner. He tells us that the two friends, being each of them possessed of one of these needles, made a kind of dial plate, inscribing it with the four-and-twenty letters in the same manner as the hours of the day are marked upon the ordinary dial plate. They then fixed one of the needles on each of these plates in such a manner that it could move round without impediment so as to touch any of the four-and-twenty letters. Upon their separating from one another into distant countries they agreed to withdraw themselves punctually into their closets at a certain hour of the day and to converse with one another by means of this, their invention. Accordingly, when they were some hundred miles asunder, each of them shut himself up in his closet at the time appointed and immediately cast his eye upon his dial plate. If he had a mind to write anything to his friend he directed his needle to every letter that formed the words which he had occasion for, making a little pause at the end of every word or sentence to avoid confusion. The friend, in the meanwhile, saw his own sympathetic needle moving of itself to every letter which that of his correspondent pointed at. By this means they talked together across a whole continent, and conveyed their thoughts to one another in an instant over cities or mountains, seas or deserts. * * * * * In the meanwhile, if ever this invention should be revived or put in practice, I would propose that upon the lover's dial plate there should be written, not only the four-and-twenty letters, but several entire words which have always a place in passionate epistles, as flames, darts, die, languish, absence, Cupid, heart, eyes.

An Electric Railroad with Steep Grades.

The double-track electric railroad between Butte and Centerville, Mont., is 13½ miles long, and overcomes an elevation of 416 feet, the grades ranging from six and 7½ per cent. in the steeper parts of the line. The road was built under the general direction of Francis W. Blackford, who described it in a paper read before the Montana Society of Engineers. The crossings of three steam railroads were made overhead by steel span or plate girders, the other crossings, four in number, were wooden bent trestles, planned to carry "Jumbo" cars of 15 tons weight, with a load of 180 persons, or a total weight of 30 tons. The elevation of the track on curves was computed for a speed of 12 miles an hour.

The power supplied to the cars is enough to enable them to ascend much steeper grades, the objection to the heavy grades being the difficulty in safely descending them. The safe descent is, indeed, the special feature of the operation of this line. Except on the paved streets of Butte, the road is laid throughout with 52-pound second-hand steel rail that had been in use on the Oregon Short Line railway. The rail was but little worn, and made an excellent track. The rails are bonded with the Atkinson horseshoe bond, cross-banded every 600 feet. The power is transmitted by an overhead wire, supported by cedar poles on each side. The feed wire, however, does not follow the turnings of the road, but runs straight up the hill and feeds at the crossings and at the end of the line.

The road is supplied with 16-foot single-truck cars with 30-inch wheels, each car having two 35 horse

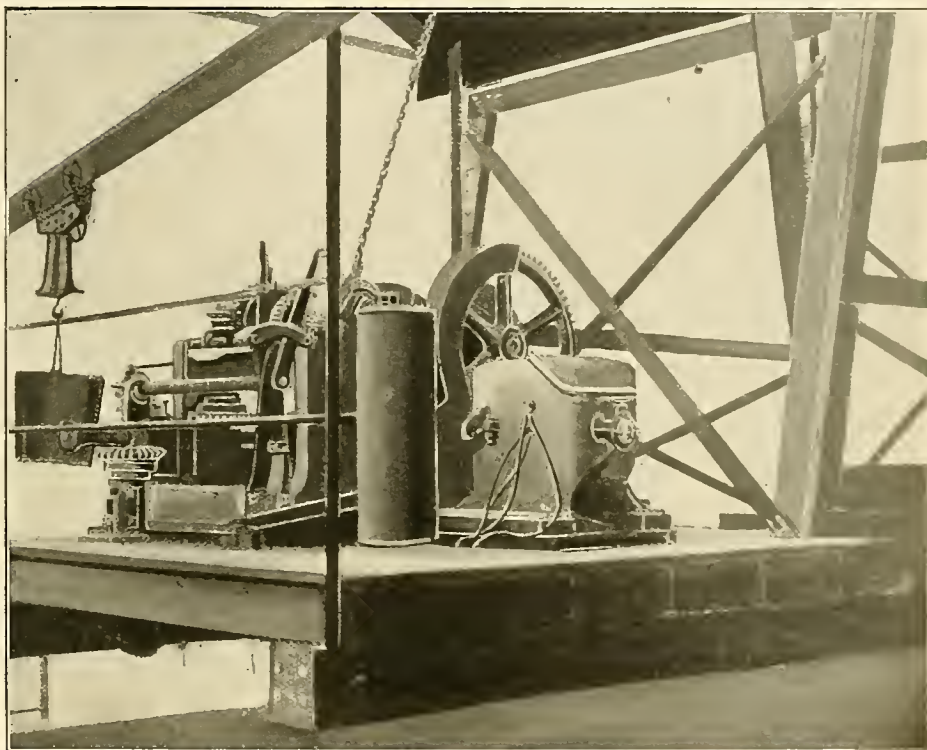


FIG. 2. ELECTRICALLY DRIVEN TEMPERLEY TRANSPORTER.— MOTOR CONTROLLER AND HOISTING APPARATUS.

hang, down and the like. This would very much abridge the lover's pains in this way of writing a letter, as it would enable him to express the most useful and significant words with a single touch of the needle.

Rates of Fare to New York Convention.

The Trunk Line association has granted a rate of a fare and one-third, on the certificate plan, from all points in its territory and return for delegates and friends attending the twenty-second convention of the National Electric Light association, to be held in New York May 23d, 24th and 25th. It is expected that the same rate will be granted by the other railway associations at an early date.

Mr. W. Forman Collins has been appointed master of transportation for Chicago and vicinity.

COMMUNICATION.

Electrical Carbonization of Wood.

To the Editor of the Western Electrician:
Will you kindly make known to your readers whether the carbonization of wood has ever been attempted by the use of electricity on such a scale as would demonstrate the practical economy of producing charcoal for commercial purposes by an electric process?
G. E.

Chicago, April 13, 1899.

Advices from Joplin, Mo., last week stated that zinc ore broke all records, and jumped from \$47 to \$50 a ton, the highest price ever paid and double the price paid a year ago.

power motors. In addition to the usual chain brake, the cars have the General Electric brake, the latter being used as an emergency brake only. The trip from the corner of Park and Main streets, Butte, to the corner of Center and Main streets, Centerville, is made with ease in 15 minutes. Each car makes two round trips an hour. The line has been in successful operation since August 7, 1898, and no accidents or runaways have occurred. In only one instance has the emergency brake been applied.

Two Unusual Fires.

The focusing of the sun's rays by an electric-light bulb set fire to a curtain in the home of John M. Sager in New York last week. Mr. Sager's three-year-old daughter, Lily, was burned. Her condition is not dangerous. Her mother saved her and put out the fire as well. An investigation showed that the incandescent electric lamp had caused the fire in the manner indicated. Mrs. Sager had decorated the bulb with ribbons and crochet-work, and had hung it in the window.

A four-ton load of hay on a truck was ignited in Chicago a few days ago while passing through the Root street subway under the Rock Island tracks. It was completely destroyed. The driver when apprised of his danger jumped to the ground, unhitched the horses and sent in an alarm. When the Fire Department arrived the load of hay was a mass of flames. Water was turned on and the truck saved. The fire was attributed to one of the wires on the load of hay coming in contact with the overhead trolley wire, causing a spark which set fire to the hay.



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CORRESPONDENCE relating to electricity or any of its practical applications is cordially invited, and the co-operation of all electrical thinkers and workers earnestly desired. Clear, concise, well written articles are especially welcome; and communications, views, news items, local newspaper clippings, or any information likely to interest electricians, will be thankfully received and cheerfully acknowledged.

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DEPARTMENTS.

Table listing departmental contents like 'Correspondence', 'Electric Lighting', 'Electric Vehicles', etc., with page numbers.

be convincing. This will be "Japan's World's Fair of 1902." The government is anxious to convince the civilized world that it has become the equal of occidental nations in the way of industries and progressive commerce. All countries will be invited to send delegations and exhibits. While the proposed world's fair is intended nominally to give Japan a chance to show what she can do, it is apparent that she is anxious to study at close range the industrial achievements of other nations. For that reason it would be wise for American exhibitors to avail themselves of the new patent-right law of Japan which has just gone into effect.

The daily papers announce the invention of an instrument by a young experimenter in Alabama by which "two young men horn totally deaf were enabled to hear sounds." The same electrical principle is employed in a large apparatus by which an instructor can communicate speech to any number of pupils at one time without confusion. The inventor has put together a portable instrument by means of which a deaf mute was enabled to hear the playing of a piano at a distance of 60 feet and to distinguish a voice in ordinary conversation. The details of the experiment and a description of the machine will be awaited with general interest. A great deal of attention has been given this subject in Europe, and many interesting experiments conducted there have been described in the Western Electrician. It is to be hoped that some real advancement has been made by the young inventor in Alabama.

Many suggestions of interest and value, or otherwise, are offered for the consideration of Marconi and his associates who are engaged in developing the art of signaling through space. The London correspondent of the New York Sun steps forth with the following proposition:

The suggestion occurs to me just here, and I give it for what it may be worth, that the recent experiments in high kite flying at Blue Hill by means of wire cord might be made the means for testing practically the possibilities of wireless telegraphy over considerable distances. A kite flown from the top of Blue Hill, just outside Boston, might furnish means of communication with another kite-borne wire a thousand feet high near New York. If that proves successful Mr. Rotch has only to send one of his mile-high soarers to England, and the Sun's London correspondent will be glad to send the news of Europe to him at Blue Hill per ether waves with celerity and dispatch.

In view of the fact that the experiments already recorded include the transmission of messages over comparatively short distances, it is greatly to be feared that the newspapers will be compelled to continue paying tribute to the present telegraph companies in the form of cable tolls for a short time at least.

A damage case growing out of injuries alleged to have been sustained through the ignorance or carelessness of X-ray operators is now on trial in Chicago. The plaintiff in 1896 sustained an injury which affected his ankle, and he submitted the injured member to an examination under X-rays. The apparatus, he claims, was not properly handled, and a serious burn was inflicted which ultimately necessitated the amputation of his foot. Several operations had to be performed, and great physical pain as well as the loss of a foot are all charged to injuries sustained at the hands of the operators who made the sciagraph. Accordingly, claim is made for \$25,000 damages.

A somewhat similar case attracted considerable attention abroad recently. A prominent surgeon of Paris who was treating a young woman for an affection of the thigh joint attempted to secure a sciagraph of the seat of the trouble. The patient posed three times. The third exposure lasted over an hour, and it was subsequently noticed that stripes appeared on the skin, which was apparently burned. This burn resulted in a wound that caused long illness, and the patient sued the doctor for 5,000 francs damages. One of the witnesses, Dr. Bardet, secretary of the Société Thérapeutique, testified that burning would result in rare instances from the use of the Röntgen rays. Everything depended on the patient's physical condition. He maintained that if doctors were made responsible for such accidents they would be obliged to renounce the use of the rays.

In the case now under consideration in Chicago the defense declares that the injuries were not due

to burning by X-rays. Moreover, it is contended that at the time of the exposure practitioners had little reliable information concerning the action of the rays upon which to base their operations, and that it would be unjust, therefore, to judge their work at that time by the standard of efficiency that has since been established.

Development of electrical interests in Japan has created such a demand for copper that the industry is now enjoying the greatest boom ever known in that country. The Japan Times, commenting on this favorable condition, says: "Markedly increased as the output has recently become, so extraordinary is the demand for the metal that the prospective yields of the principal copper mines in Japan are already covered by contract; so that, for want of the commodity, further transactions are said to be practically suspended in Tokyo and Yokohama." The importation of copper has also increased during the last few years.

Statistics are quoted from the Chugai Shogyo showing the total consumption of copper in the empire to have increased from 5,936,000 pounds in 1892 to 12,355,000 in 1896. In 1892 the Japan mines furnished all but 76,000 pounds, and in the following year, although their output was reduced 20,000 pounds, the demand was so much less that only 7,000 pounds of copper was imported. In 1894 the output of the Japan mines was almost doubled and the imports increased to 51,000 pounds. There was a slight falling off in the home production in 1895, but the imports were largely increased, 156,000 pounds being admitted. The high-water mark for both home and imported copper was reached in 1896 (the latest statistics available), when 199,000 pounds had to be imported into the country to meet the requirements, although the output of the Japan mines amounted to 12,155,000 pounds.

Street-railway corporations which have contracts with the government for carrying mail will be interested in the litigation growing out of a labor controversy in which this matter played an important part. Judge John J. Jackson of the United States District Court for the District of West Virginia granted an injunction at the instance of the Wheeling Street Railway company, restraining certain striking motormen and conductors of that corporation from obstructing the operation of its cars or damaging the property of the complainants. The jurisdiction of the federal court was invoked on the ground that the railroad company is engaged in commerce between different states and in the transportation of the government mails. In the celebrated Debs case a similar injunction was maintained in a suit instituted by the direction of the attorney-general in the name of the United States, and the Supreme Court refused to interfere with the action of the Circuit Court in Illinois, adjudging the persons who had violated that injunction guilty of contempt and sentencing them to imprisonment. Labor organizations have frequently protested against the postoffice making contracts for this purpose, appreciating the advantage the companies would enjoy, but the government has refused to consider this feature of the question.

When the street-railway company at Wheeling attempted to run its cars last week the strikers' sympathizers interfered, and the men who had been secured to fill the places of strikers were roughly handled in many instances. On Tuesday Judge Jackson pronounced sentence upon five men who had been arrested by deputy marshals for various offenses which the court holds are violations of the blanket injunction issued by him the day after the strike began. The men under arrest were sentenced to pay fines of \$50 each and to go to jail for 30 days. After sentence had been pronounced Judge Jackson described labor unions as communistic clubs, and he denounced the people of the city who sympathized with the strikers. He said that the people had no right to conclude that the street-railway company should pay more wages than it felt willing to pay. The strikers had the right to quit, but had no right to use any means to prevent others from taking their places.

Judge Jackson's outburst has had the effect of intensifying the feeling against the street-railway company, and has really stimulated and secured accessions to the forces of the strikers.

In describing the equipment of a new manufacturing establishment in London recently a prominent trade journal made particular mention of the fact that "the shops are equipped with machines of the latest type, which have been obtained from America." This is certainly a substantial claim for recognition, but we are surprised that it has been so freely acknowledged.

If proof were needed to establish the fact that Japan is rapidly taking on European and American ways, the preparations that are now being made for an exposition in the mikado's realm would certainly

Marconi's Experiments.¹

By J. A. FLEMING

During the last few days I have been permitted to make a close examination of the apparatus and methods being employed by Signor Marconi in his remarkable telegraphic experiments between South Foreland and Boulogne, and at the South Foreland lighthouse have been allowed by the inventor to make experiments and transmit messages from the station there established both to France and to the lightship on the Goodwin Sands, which is equipped for sending and receiving ether-wave signals. Throughout the period of my visit messages, signals, congratulations and jokes were freely exchanged between the operators sitting on either side of the channel, and automatically printed down in telegraphic code signals on the ordinary paper slip at the rate of 12 to 18 words a minute. Not once was there the slightest difficulty or delay in obtaining an instant reply to a signal sent. No familiarity with the subject removes the feeling of vague wonder with which one sees a telegraphic instrument merely connected with a length of 150 feet of copper wire run up the side of a flagstaff begin to draw its message out of space and print down in dot and dash on the paper tape the intelligence ferried across 30 miles of water by the mysterious ether.

The public have already been placed in possession by the Times and other agencies of a general description of the apparatus employed by Signor Marconi, and there is no need, therefore, to enter into technical details. Within the last few days also various scientific men have been invited to give the public the guidance of their opinions on the novelty and utility of these demonstrations. These criticisms have for the most part not been of a very helpful character. The general public are not much concerned with questions of priority or with the claims or suggestions of rival experimentalists, but they are interested in ascertaining the serious possibilities of that which has been actually achieved. Signor Marconi has never hesitated to acknowledge that he has built upon the foundations laid by others, but a vast gulf separates laboratory experiments, however ingenious, from practical large-scale demonstrations conducted with all that regularity and freedom from failure which is the absolute condition of their public utility.

I cannot help thinking that the time has arrived for a little more generous appreciation by his scientific contemporaries of the fact that Signor Marconi has by minute attention to detail, and by the important addition of the long vertical air wire, translated one method of space telegraphy out of the region of uncertain delicate laboratory experiments and placed it on the same footing as regards certainty of action and ease of manipulation, so far as present results show, as any of the other methods of electric communication employing a continuous wire between the two places. This is no small achievement. The apparatus, moreover, is ridiculously simple and not costly. With the exception of the flagstaff and 150 feet of vertical wire at each end, he can place on a small kitchen table the appliances, costing not more than £100 in all, for communicating across 30 or even 100 miles of channel. With the same simple means he has placed a lightship on the Goodwins in instant communication, day and night, with the South Foreland lighthouse. A touch on a key on board the lightship suffices to ring an electric bell in the room at South Foreland, 12 miles away, with the same ease and certainty with which one can summon the servant to one's bedroom at a hotel. An attendant now sleeps hard by the instruments at South Foreland. If at any moment he is awakened by the bell rung from the lightship he is able to ring up in return the Ramsgate lifeboat, and, if need be, direct it to the spot where its service are required, within a few seconds of the arrival of the call for help. In the presence of the enormous practical importance of this feat alone, and of the certainty with which communication can now be established between ship and shore without costly cable or wire, the scientific criticisms which have been launched by other inventors against Signor Marconi's methods have failed altogether in their appreciation of the practical significance of the results he has brought about.

The public, however, are not in the least interested in learning the exact need of merit to be apportioned to various investigators in the upbuilding of this result. They do, however, want to know whether the new method of communication across the channel established by the expenditure of a few hundred pounds will take the place to any considerable extent of submarine cables which have cost many thousands of pounds to lay and equip. They do also desire to learn what reasons, if any, will prevent every lighthouse and lightship round our coasts from being forthwith furnished with the necessary apparatus for placing it in instantaneous and secure connection with the mainland. They also hope to hear that the methods can be applied to enable ships to be able in addition to communicate instantly in case of need with shore stations. To understand how far these things can be done, and to appreciate the necessary or present limitations of the method, it is requisite to explain that each vertical wire or rod connected to a Marconi receiving or sending apparatus has a certain "sphere of influence." Signor Marconi has proved by experiment up to

certain limits that the distance to which effective signaling extends varies as to the square of the height of the rod. A wire 20 feet high carries the effective signal one mile, 40 feet high four miles, 80 feet 16 miles, and so on. Up to the present time he has not yet discovered any method of shielding any particular rod so as to render it responsive only to signals coming from one station and not from all others within its sphere of influence. In spite, however, of what has been said, there is no inherent impossibility in attaining this desired result. At present all signals sent from the South Foreland to France affect the receiver on board the Goodwin lightship. But this offers no difficulty. In an ordinary electric-bell system in a hotel the servant recognizes the room from which the signal comes by means of a simple apparatus called an indicator, and a very similar arrangement can be applied to distinguish the origin of an ether-wave signal when several instruments are at work in a common region. Subsequent inventions, as also perhaps the promulgation of some necessary Board of Trade regulations for the use of the ether, will prevent official ether-wave receivers from being disturbed by vagrant electric waves sent out by unauthorized persons in their neighborhood. The practical upshot, however, of the matter is that at present if more than two stations are not established within certain regions these stations, pair and pair, can communicate with each other freely and regularly by means of ether-wave signals sent out and received by long vertical rods or wires. No state of the atmosphere, and neither darkness nor storm, interrupts, so far as yet found, the freedom of communication.

Up to the present time none of the other systems of wireless telegraphy employing electric or magnetic agencies has been able to accomplish the same results over equal distances. Without denying that much remains yet to be attained, or that the same may not be affected in other ways, it is impossible for anyone to witness the South Foreland and Boulogne experiments without coming to the conclusion that neither captious criticism nor official lethargy should stand in the way of additional opportunities being afforded for a further extension of practical experiments. Wireless telegraphy will not take the place of telegraphy with wires. Each has a special field of operations of its own, but the public have a right to ask that the fullest advantage shall be taken of that particular service which ether-wave telegraphy can now render in promoting the greater safety of those at sea, and that, in view of our enormous maritime interests, this country shall not permit itself to be outraced by others in the peaceful contest to apply the outcome of scientific investigations and discoveries in every possible direction to the service of those who are obliged to face the perils of the sea. If scientific research has forged a fresh weapon with which in turn to fight Nature, "red in tooth and claw," all other questions fade into insignificance in comparison with the inquiry how we can take the utmost advantage of this addition to our resources.

Street-railway Progress on the West Side.

In Chicago the reports of elevated and surface railway companies show that traffic is at present increasing more rapidly on the West Side than in any other part of the city. During March the average daily traffic on the Metropolitan elevated lines was 79,500, a gain of over 14 per cent. compared with the corresponding month of last year. In the same month the West Chicago Street Railroad company carried about 216,000 passengers a day, a gain of over five per cent. The Lake Street Elevated also shows a good increase, due largely to the new incline and surface extension to Austin and Oak Park.

Work is progressing steadily on the 4,500 horse power extension to the power generating plant of the Metropolitan company. Two units of 2,250 horse power capacity each are building in the enlarged power house, and they will be both available for use on the station load about September 15th. The station will then have a total capacity of between 11,000 and 12,000 horse power in six units. The Metropolitan company has rented headquarters in the Royal Insurance building, on Jackson street, to which it will move on May 1st. The West Side Construction company will then remodel the old terminal property on Franklin and Market streets and will probably sell it.

Limitations of "Wireless Telegraphy."

[From the London Electrician.]

Already one of the practical limits to wireless telegraphy, as at present practiced, is making itself manifest in the Marconi group of signal stations to the southeast of this island. "At present," writes Professor Fleming, "all signals sent from the South Foreland to France affect the receiver on board the Goodwin lightship." The professor thinks that this "offers no difficulty," and he suggests a means for discriminating between the signals. There is a difficulty left untouched, however, in the impossibility of sending messages simultaneously and independently to or from the lightship and France. An uninterrupted stream of messages between the stations on opposite sides of the channel would render com-

pletely useless the apparatus which is now used. Curiously enough, the first inventor of Wireless Telegraphy, that the apparatus created the same effect in the order took the form of hermetically sealed glass tubes between the two color stations, and was heard; indeed, the Wimeron station received the message, "We are going to pass Boulogne at five o'clock"—this having been sent from the light-ship to the light-ship.

This result, of course, had been foreseen, but the actual occurrence emphasizes the need for a means for confining a Marconi message strictly to its proper path. The sphere of influence of a wireless telegraph station has a fatal tendency to become too literally spherical. Messages scattered broadcast not only waste energy by traveling with functionless force toward celestial space; they do positive mischief by interrupting the everyday business of irrelevant stations in the vicinity. If the Marconi wave could confine themselves strictly to business, the prospects of wireless telegraphy would be enormously brighter than they now are. We are not without hope that ere long a satisfactory method of thus restricting their activity will be discovered.

Why Does Electricity Influence Plant Growth?

In a recent treatise on "Electro-horticulture," by Dr. George S. Hull, the author treats in successive chapters of the application of atmospheric electricity to the roots of plants and to the surrounding soil, of the similar application of currents from batteries, and of the effect of the electric light upon vegetation. That the general effect is beneficial he has no doubt. How does this action take place? Dr. Hull says:

"In considering the action of atmospheric electricity upon vegetation, we have to deal with a stimulus which exists in abundance. Plants grow most vigorously where it is most abundant and with greatest rapidity in the early morning, when the dew is most plentiful upon them, making them better conductors. Its most important action upon the stalks of plants is that of increasing their circulation of sap.

"Discharges of electricity in the air, especially during thunderstorms, cause some union between the oxygen and nitrogen in the vicinity of the discharges, forming oxides of nitrogen, which, being soluble in water, are carried to the roots of plants and absorbed by them directly.

"Electricity passed through the soil by earth batteries, the geomagnetifer, or other means, has some action upon its chemical constituents. . . . Currents of electricity may break up the more complex compounds in the soil into simpler ones, upon which the roots of plants may feed. . . . Others think that in some manner, under the electric influence, nitrogen from the air combines with some other substances in the soil, making compounds which are readily absorbed by roots of plants. A recent experimenter claims that the particles of electrified earth are set into molecular vibration, thus loosening the earth."

It is also probable that electricity has a stimulating influence on the bacteria that adhere to the roots of certain plants and convert the atmospheric nitrogen into soluble nitrates for them to feed upon. That electricity is especially stimulating to micro-organisms there is plenty of evidence to show. In conclusion, Dr. Hull gives what he calls a "glimpse of an electric farm of the future," in which the discoveries that he has described will be combined with results of investigations yet to come, for the benefit of scientific agriculture. The abstract quoted here was made by the Literary Digest.

Discovery of Acetylene.

[From the Ottawa, Ont., correspondent of the Western Electrician.]

The facts relating to the discovery of acetylene gas are interesting. It appears that some years ago Thomas L. Willson of St. Catharines, Ont., was smelting for metallurgical purposes. From time to time he used a good deal of rock salt in his furnace stock, and also limestone as a flux. Whenever these two materials were fused together the slag produced by the intense electrical heat included a dirty grayish substance wholly unlike anything else he had ever seen. For weeks he noticed this substance without giving more than passing attention to it, dumping it into the stream upon the bank of which he had built his furnace. One day a curious thing occurred and at a time when the pile of slag had become so large that its top rose above the surface of the water. A minute or two after dumping the slag as usual into the stream, some of it going under and part remaining above the water in a red-hot state, the sizzling and steaming was followed by a bright burst of flame. The next time Mr. Willson used rock salt and limestone the blaze again appeared over the slag after it had been cast into the river, and, it being at night, he was much struck by the brilliant white light produced. The next time that he had a batch of the queer grayish residue to dispose he did not waste it but saved it and poured over it some water for experiment. To his surprise there was no flame, but after pouring a while over this feature he held a lighted match over the pile, when instantly there was a white, glowing flame, and Willson knew he had found something worth while. His discovery was acetylene gas.

1. From the London Times.

DEVELOPMENT OF THE TELEPHONE FIELD.

Telephone Competition for Rochester.

[Special correspondence of the Western Electrician.]

Rochester, N. Y., is the latest large city to feel the effect of a war against the Bell Telephone company, and, recognizing the enterprise and reliability of a new organization, the Common Council of the city has granted the Home Telephone company a franchise by the vote of 17 to three. The wires of the company are to be laid in conduits, and the rate is to be \$18 a year for residence and business telephones alike. The company had already secured 1,500 subscribers when the franchise was granted. It is provided that work on the system shall begin within a month and be prosecuted diligently. Within two months the company must exhibit to the mayor 1,500 bona fide subscriptions for telephones on five-year contracts, and the system must be in actual operation with at least 2,000 telephones within 15 months from the time the franchise was granted. By way of compensation the Home company will give the city 40 free telephones, which, at the same rate as the city has been paying, means a saving to the taxpayers of \$4,000 a year, and for the period the city has been paying the Bell company for the same instruments \$100,000 would have been saved to the people. It is intimated that the Bell people will fight the franchise, but in Rochester, as throughout Western New York, the people are very anxious for independent telephone service, having tired of being bound to a monopoly.

The directors of the Home Telephone company are Hon. Frederick Cook, Thomas W. Finucane, George W. Archer, Albrecht Vogt, H. Wheeler Davis, Gustave Erbe, George R. Fuller, Jacob Gerling, J. Foster Warner, Edward W. Peck, Horace Brewster, Eugene H. Satterlee, Willard B. Spader, V. Moreau Smith, Ezra M. Higgins. A meeting was held last week for the purpose of completing plans for the immediate installation of a plant. The first business done was the drafting and adopting of a resolution authorizing Mr. Cook to execute a contract with the city under the franchise granted. The directors also appointed a number of committees to look after the several branches of the work to be done. The company has suffered a delay of eight months in the franchise matter, and during that time plans of construction were held in abeyance. It will take some time to complete and perfect them.

It has been suggested that the Bell company may apply for an injunction restraining the Home company from going on with the construction of the line, hoping thereby to delay the new company from proceeding until the time limit fixed in the franchise for the operation of an exchange shall have expired, thereby annulling the franchise. Even in such an event, the Home company does not believe that the Common Council would cut them off for an unavoidable delay.

The present movement has been bitterly contested by the Bell interests at every step, and its agents have been at work for months in Rochester. The controversy recalls the memorable struggle between the Bell company and the people of Rochester in 1886, when the city revoked the license of the company, the subscribers hung up their instruments and the service was stopped. It was the most remarkable controversy that has ever been waged against a powerful corporation, and as it resulted in a complete overthrow of the Bell forces, the appended historical sketch, prepared by M. W. Cooke, and published in the Rochester Municipal Manual, will be particularly interesting at this time:

In 1879 a few citizens of Buffalo associated themselves and organized the Bell Telephone company of Buffalo, under the laws of 1848, passed for the incorporation of telegraph companies. The capital stock when incorporated, was \$30,000, and the line extended from Buffalo to Rochester and through the intermediate counties. Its object was to introduce the use of the Bell telephone, the patents for which were controlled by the American Bell Telephone company, which company took 35 per cent. of the stock of the Buffalo company and held the right to name three of the directors; and the "parent company" received \$14 per annum for the use of each telephone, besides 35 per cent. of the profits, to which it was entitled by its stock, according to the representation of the general manager of the company. It was generally understood that the American Bell Telephone company acquired by purchase a sufficient number of shares of the stock, in addition to the 35 per cent., to control the management of the Buffalo company.

An exchange was established in Rochester and the operations of the company here were commenced and conducted by the use of wires carried, for the most part, over the lands and buildings of individuals. No legal proceedings for condemnation were instituted for the reason that agreements or licenses were obtained from a limited number for such occupation, and, in other cases, the use of private property was appropriated without license or contract.

In 1886 the company petitioned the Common Council for the right to erect poles and string wires upon and over the streets and property of the city, and the right was voted to the company, and it was provided that the wires of the fire-alarm-telegraph system should be carried upon the company's poles and standards, and that the poles to be erected should be "straight and slightly." This resolution was followed by like permission from the Executive Board of the city, providing in addition that the superintendent of the fire-alarm system should locate the poles and that the company should erect poles when needed for that system. The company now needed its business by making contracts with our citizens for the use of telephones at a "flat price" or at a fixed charge per annum for the use of each set of instruments. The price seemed reasonable and many citizens became patrons of the company's telephone subscribers. Subsequently a very large increase was made in the price for the service and the effect was to create great dissatisfaction. Many discontinued the use of the telephone, and no concerted resistance was made to the execution of the new price. It was claimed by the company, was a "benefit" to the comparatively small number of patrons of the telephone, and it was distinctly held out to the people of Rochester

that an increase in the number of subscribers would be accompanied by a corresponding reduction in the price. Alured by this representation, the people submitted, and continued and increased the patronage of the telephone until the number had reached very nearly 1,000, and the annual receipts from them conceded amounted to upwards of \$54,000. In 1883 the company claimed that it procured from the mayor the execution of a document under the seal of the city, purporting to secure to the said company the unlimited right to the use and occupation of the property and streets of the city without power of revocation, and conditioned only by the provision for the use of the poles by the wires of fire-alarm system, and by the provision that the poles be "straight and slightly." This alleged contract was not directed or authorized by the Common Council, and it could not legally authorize such a contract if it so desired. Under the said resolutions and alleged contract the company caused to be erected upon the south sides of East and West Main streets and on the east side of State street—the main thoroughfares and business streets of the city—large masses of pine about ninety feet high and placed in the ground without charter, and apparently without regard to their fate after a few years after the expiration of the Bell patents—it being a patent fact that pine poles so set will last but six or seven years in the ground. In October, 1886, the poles had been so placed and the wires of the company carried thereon; and, by the supposed contract with the city, the company assumed that it was rendered independent of the owners of private property for the transaction of its business so far as the continuation and construction of its plant were concerned. The business had become so established that the designing controllers of the company regarded the use of the telephone as a necessity to the citizens of Rochester, and so it then seemed to the people generally.

In October the company, through the press, heralded a change of the system of rearing telephones and the collection of its revenue in the city of Rochester, to wit, the flat price was to be abandoned November 1, 1886, and the "toll system," so called, introduced. It was proclaimed that the intended change was not designed or calculated to impose any additional burden upon the telephone subscribers, nor to increase the revenue of the company, but to protect it against the free use of the instruments by persons who were not subscribers. Not long afterwards the declaration came in definite form. It was an arbitrary schedule or tariff sheet made and issued without the sanction of the patrons to the telephone; and it initiated a radical change in the relation of the employers (the subscribers) and the servant (the company) supplying telephone service. It helied the proclamation heralding it; and instead of being a change for the benefit of the subscribers or the service, or one which would not impose additional burden upon them, it was, upon its face, an attempt to accomplish a very large increase in the revenue of the company for the same service, and a corresponding increase in the burdens upon the patrons, the company under the pretense of a necessitated change of system to guard the subscribers and the company against abuses. The company claimed that its necessities demanded an increase of 50 per cent. in the price if the toll system was not adopted. It was argued by the company that this system would enable each subscriber to collect from his neighbor, friend or customer, in addition to the increased charge he paid, a toll without limit. The general manager said the company did not desire to get more out of the subscribers, but to get the increased revenue out of the non-subscribers—the "outsiders," as he called them. He would make the "deadheads" living patrons by the aid and enforced service of the paying subscribers. This toll sheet provided for the sale of a large number of messages at two cents each, assuming that messages might be sold at wholesale; whereas it is apparent that the service of each message would be at the same cost to the company and each one interrupt the use of the line exactly the same as if it cost the sender ten cents. The device was clearly to get more money out of or through the aid of the subscribers.

Nay, it was more; it was an attempt to seize upon and occupy the stores, offices and residences of our citizens by this company for the transaction of its business without payment of rent. The toll price proclaimed was a flat price of \$50 for 500 messages to subscribers within a radius of one-half a mile, thus making each subscriber guarantee a revenue of \$50 or 10 cents per message, accompanied by a charge of six cents for every message after the 500 messages (less than two in a day) had been exhausted. To subscribers outside the half-mile an addition of \$20 per mile was made, making the first 500 messages cost 24 cents each, and six cents for all over that amount. Besides the imposition of the additional expense the change required the keeping of an account of messages and records, which had become a constant source of irritation and dispute. This system was objectionable upon other grounds, and they were so evident and fatal that the subscribers refused to discuss the propriety of the introduction of the system contained in said sheet, and preferred to dispense with the luxury entirely than be subjected to the expense, annoyance and trouble which would necessarily accompany the change dictated.

A decision of the Court of Appeals informed the company that the cords by which it was supposed the city was bound were ropes of sand and the gag a harmless device. The alleged contract was void and inoperative, as a contract, and all the city had to do was to assert its rights. Thereupon the Common Council, by resolution unanimously revoked all license, express or implied, to said company for the occupation of its streets or property.

The Executive Board did the same and the mayor reprimanded the company for deceiving him in 1883. The telephone subscribers flocked to the city hall, and in a deliberate and determined manner organized for resistance to any further legalized robbery of the city or its people, and resolved not to use, nor to allow to be used on their premises, said telephone until the company furnished such guarantees as the Common Council should demand to protect the city and the public from the abuse of the franchise from the city; that they would not, in any event, submit to the "toll system" as stated, and that such of them as were compelled by unexpired contracts with the company, to pay during the suspension must be treated equitably by the company upon such contracts.

Nearly every subscriber silenced his telephone November 20, 1886, at noon, and so they have remained and will remain until the offender brings forth "fruits meet for repentance."

In December, 1886, the telephone company erected a pole on the corner of Court and South Union streets, Seventh Ward, in the night or in the early hours of the morning, in defiance of the action of the city. The Executive Board directed the street superintendent to take down the pole unless the company did so within 24 hours. Upon notice of this action the company procured a temporary injunction and moved the Supreme Court to continue it at special term. After a hearing the court denied the motion with cost, and the decision was followed by a removal of the said pole by the company.

Subsequently an action was brought by the people of the state of New York in the name of the attorney-general against said company for purpose of removing the poles and structures in the streets as a public nuisance.

THE SETTLEMENT.

The People's association, after long negotiations, not being in position legally to make contract, referred the matter to the council, which effected the settlement; it was signed by the mayor and company May 10, 1888, and ratified by the People's association. The principal points follow: The rate will be a flat rate, for at least five years; the council's law committee can supervise the form of contract; the company's wires shall be strung along in the principal streets, one-half mile a year, until three miles are laid; the city has the free use of one two-wire duct in conduit. Telephone subscribers who ceased using their instruments in November, 1886, and who contract for service prior to June 1, 1888, shall receive credits for the amounts paid by them for service after November 20, 1886. All claims upon the contracts with subscribers existing November 20, 1886, for moneys which become payable hereafter, shall be collected. In litigation "cost" the Bell company shall pay reasonable counsel fees of the People's association.

Rights of Telephone Companies.

In the Circuit Court at Hagers Grove, Mo., last week a bill in equity was filed by the Shelby County Telephone company against A. L. Perry and others, asking the court for an injunction restraining defendants from running a telephone line into the city of Clarence, and also to prevent defendants from using or operating their line from Leonard to Clarence, so as to interfere with the operation of the line previously constructed between the two points by the Shelby County Telephone company.

It seems the Shelby County Telephone company has purchased a franchise from the city of Clarence for a telephone exchange in that place, in accordance with the Julian franchise law, enacted in 1893. This act has since been declared inoperative by the Supreme Court. The question now is as to the rights of telephone companies which erected telephone systems under the provisions and protection of this law before it was declared void. Do the merits of the law still apply and protect in any degree those who complied with its provisions when it was in force?

The other question involved refers to the rights of a pioneer or previous telephone line over a line built later. The Shelby County Telephone company states that it erected a line from Leonard to Clarence some years ago and later defendants erected a line parallel to it or along the same highway, and that the service of the Shelby County Telephone company's line has been impaired, the sound from one line reaching over to the other line and rendering conversation difficult.

At the trial several expert witnesses were examined, and the case attracted considerable attention. As this is the first case of the kind to be brought in Missouri, it will be closely watched. The case was transferred to the Macon Circuit Court, where the matter will be reopened and more testimony taken.

Difficulties of "Wireless Telegraphy."

[From the London Electrician.]

Wireless telegraphy an accomplished fact, wireless telephony obviously suggests itself to those seeking fresh fields and pastures new. Where Hertzian waves are made the vehicle, and the coherer is the means of receiving the transmitted energy, the difficulties of telephony are immensely greater than those of telegraphy. The high frequency of sound waves makes it impossible for any known form of coherer to respond to ether waves correspondingly frequent; while their irregularity, when speech is the sound to be transmitted, would render syntony impossible, even were transmission an accomplished fact. Rumor reaches us of successful wireless telephony in Belgium; but, from intimate acquaintance with the difficulties of the problem, we judge that the method adopted, if this rumor be true, was not one involving the use of the coherer. By leakage, or by magnetic or electrostatic induction, telephony without connecting wires is, of course, possible, and, within limits, commercially practicable. Its range of usefulness, however, is greatly restricted. Indeed, the immediate prospects of wireless telephony would appear to be decidedly inferior to those of the Marconi system of telegraphy.

Cook Invention Sustained.

In the Western Electrician of January 21st mention was made of a Patent Office decision in favor of Frank B. Cook, vice-president of the Sterling Electric company, in an interference suit brought by him against the Western Electric company, involving the broad principle of protection for telephone circuits. From that decision the Western Electric company appealed, and a decision is now rendered on the appeal, which not only sustains the former decision, but, it is claimed, gives a decision more favorable to Mr. Cook. The protector in dispute is largely used by Bell companies, and is the well-known combined terminal and protector manufactured by the Sterling Electric company of Chicago, which is being generally used by the independent companies in Indianapolis, St. Louis, Cleveland, Saginaw, Bay City, Lafayette, Wilkesbarre, Ashabula, Janesville, Mattoon, Danville, Oshkosh, Shreveport and other points.

Cheap and Poor.

Americans who advocate governmental control of telephone service will find that the cheap service of Germany would hardly be tolerated in this country. United States Consul Schumann writes from Mainz on this subject as follows: "The telephone service of this country is a public institution controlled and managed by the Department for Posts and Telegraphs. The rates are certainly very low, the charge for a local telephone being \$38.55 per annum, including the rental of the instrument. The service, however, is lacking in enterprise. I applied on February 20th to have a telephone placed in my residence and was told that the connection could not possibly be made before May or June, as they did not string wires in winter."

Telephone News from the Northwest.

[From the Minneapolis correspondent of the Western Electrician.]

The Wisconsin Supreme Court has decided against the Wisconsin Telephone company in the case of the city of Marshfield against the Wisconsin Telephone company. The council offered the company a franchise, but it was not acceptable, and the council refused to make any other terms. The company then proceeded to erect poles in the city without permission. The city officials cut them down and secured an injunction to prevent the company erecting any others. The case then went to the Supreme Court, where the company has lost.

The Northwestern Telephone Exchange company has secured control of the telephone exchange at Larimore, N. D., which has not been in use for some time.

The Iowa Telephone company has begun using a new switchboard in Sioux City, Ia.

The Stoughton Telephone company is an applicant for a telephone franchise at Stoughton, Wis.

The Le Grand Farmers' Mutual Telephone company will construct a line between Le Grand, Ia., and Dunbar as soon as possible.

Otto Wettstein, Jr., proprietor of the exchange in La Porte, Ia., proposes to establish an exchange in Gladbrook, Ia.

Radeliffe, Ia., capitalists will form a company to build a line to McCallsburg.

The electric-light company at Humboldt, Ia., will ask for a franchise for a telephone exchange.

The owners of the local telephone exchange at Clear Lake, Ia., have formed a company.

A local mutual telephone exchange is projected at Avoca, Ia.

The Park Region Telephone company has been formed at Alexandria, Minn., to do a local and toll-line telephone business. The capital stock is \$10,000.

The city of Duluth has asked R. H. Evans to furnish a surety bond as a guaranty that his company will establish the telephone exchange as provided by the franchise. The city of Superior has granted him a franchise similar to the one granted by Duluth.

The American Telephone and Telegraph company has been granted a franchise in White Bear, Minn.

W. D. Spayth of Toledo, Ia., contemplates a telephone line from Toledo to connect with Garwin.

The Ottumwa (Ia.) Long Distance Telephone company is arranging to extend its wires to West Point, Ia., and intervening points.

The Northwestern Telephone Exchange company has been granted a franchise through Ulen, Minn.

The Wausau (Wis.) Telephone company has put in a new switchboard with 400 drops.

The Blue Earth Valley Telephone company has ordered a 200-drop switchboard for its Wells, Minn., office.

The telephone line between Glencoe, Minn., and Minneapolis will be rebuilt in the spring and a metallic circuit substituted for the present system. A more direct connection will be made.

The Fergus Telephone company of Fergus Falls, Minn., has let the contract to a Minneapolis concern to construct the toll line from Fergus Falls to Wadena, Minn., in the spring. Materials are being delivered for the work.

The Winona (Minn.) Telephone company will push work on an extension from Rollingstone to Oak Ridge. The company has been petitioned to continue the line on from Oak Ridge to Beaver and Minneiska.

F. E. Fee is an applicant for a telephone franchise at Hartley, Ia.

The Chicago and Lake Shore Telephone company will be formed soon to establish exchanges in eastern Wisconsin. Carl H. Wells of Appleton has been appointed state manager. Exchanges will be established in Kenosha, Racine, Fond du Lac and the Fox river valley towns.

The Dakota Central Telephone company has installed a system at Britton, S. D.

The Milbank (S. D.) Telephone company has been incorporated.

The Western Stearns County Telephone company has been formed at New Paynesville, Minn., to connect with the smaller towns of the county.

J. W. Kelly pleaded guilty to robbing the Iowa Telephone company at Waterloo, Ia., and was sentenced to four months in jail.

O. F. Blasier has bought the telephone exchange at Greene, Ia.

NEW COMPANIES.

The Madison (Ohio) Telephone company has elected the following-named officers: President, C. W. De Voe of Orwell; vice-president and treasurer, F. E. Howes of Mesopotamia; secretary and treasurer, E. J. Clapp of Thompson.

A charter was granted at Charleston, W. Va., April 14th, to the People's Telephone company of New York city. The capital subscribed is \$2,000, which may be increased to \$5,000,000. The shareholders are A. Wilford Hall, George Fruck, Oscar F. Shaw, Dunne P. Cobb and Frank W. Hubby, Jr., all of New York city.

Jacob Pepper, John Schoepflin, William Kroenenberg, N. C. Fish, H. D. Pierce, John A. Kloefer and Fayette Keely of Hamburg, Erie County, N. Y., are directors of the new Hamburg Telephone com-

pany, which will operate a line from Hamburg to Buffalo. The capital of the company is \$10,000. Other towns in Erie County will be connected.

The Mohawk River Telegraph and Telephone company has been incorporated under the laws of New York, with a capital of \$21,000, to operate a telephone and telegraph system from Syracuse to Albany by the way of Oneida, Rome, Utica, Little Falls, Fonda, Schenectady and other intermediate points, and to extend its lines to Northern New York and east through the New England states to the Atlantic seaboard, and south into New Jersey and Pennsylvania. The directors are Russell R. Stuart, Daniel O'Brien and John Holihan of Syracuse, William Mason of Binghamton, Harvey J. Donaldson of Ballston and James J. Dwyer and Thomas J. Dwyer of Utica.

The Zenith City Telephone company of Duluth, Minn., has completed its organization, and elected the following-named officers: President, R. H. Evans; vice-president, J. B. Stafford of Chicago; secretary, E. H. Stafford of Muskegon, Mich.; treasurer, A. M. Miller, Jr., of Duluth. The authorized capital of the company is \$200,000, and of this amount \$85,000 is already paid up. Messrs. Evans and Stafford have taken \$55,000 of the stock, and A. M. Miller, Jr., of Duluth has taken \$30,000. All the money necessary for the completion of the plant has been arranged for. Construction will actively begin as soon as the frost is out of the ground. The work preliminary to actual construction has been going on for some time. The plans and specifications are being drawn by the company's engineers, and will be ready very soon.

EXTENSIONS AND IMPROVEMENTS.

A proposition is being discussed to establish a telephone line between Idaho Falls and Jackson, Wyo.

The Citizens' Telephone company of Woodstock, Ill., is about to open an exchange in Crystal Lake with 25 subscribers.

Gladbrook, Ia., has granted a franchise to Otto Wettstein, Jr., of La Porte City, Ia., to put in a telephone exchange. Fifty subscribers have been secured to start with.

William M. Holmes of Ashland, Ore., has been granted permission to erect a telephone line along the county roads between Central Point and Eagle Point, to be completed in six months.

The Chicago Telephone company is building a seven-story brick building at 210 and 212 Washington street, to cost \$100,000. This adjoins the old telephone building and is an extension of it.

S. S. Creider of Sterling, Ill., who was in Chicago last week, reports favorable progress in his territory for independent interests. The Bell company thus far has made no impression upon the independent organization, although it is exerting all of its influences to regain control of the field.

The Crestline Telephone company has been recently reorganized with Edward R. Farr, president and general manager; P. J. Neff, vice-president; W. S. Johnson, secretary. The capital stock is \$10,000. The system has been changed from common-return to metallic circuits and a new switchboard of 200-drop capacity has been installed.

The Galena, Kan., Telephone company will soon have its toll line completed between Columbus, Galena and Weir City. The line will then be extended to connect with Fort Scott through Girard, Kan. This company also has a franchise to build an exchange in Columbus, Kan., and work will be commenced for a complete metallic system for 100 subscribers as soon as material arrives.

On April 4th the board of directors of the Wood County Telephone company decided to establish an exchange at the village of Nekoosta, Wis., to handle its increasing business. The new exchange will start with about 25 instruments connected and good prospects of increasing the number. President Fontaine and Manager Dougherty were instructed to make the exchange first-class in every respect.

The Elkhart, Ind., Telephone company has completed arrangements for toll-line connections with adjacent towns that will doubtless prove advantageous. Mr. E. C. Bieckel, the general manager of the company, says that Barber & Brailley, who own exchanges in 26 different towns and are now building in 10 others, have "made propositions that were acceptable, both for his services and for 13 per cent. of the stock in the Elkhart company. They made no suggestion or request for a change in policy or management, except to form a closer alliance with their other properties and other long-distance companies."

MANUFACTURERS AND DEALERS.

The Farr Telephone and Construction Supply company of Chicago has issued a card giving testimonials received from a few of its customers. It is needless to say that all these buyers speak in the highest terms of the Farr products. The Farr company has always taken special pride in filling the wants of its customers in a most satisfactory manner, and it now has on its list of patrons nearly

1,000 independent telephone companies besides many other customers.

Tammany and Telephone Rates.

In the examination of Richard Croker before the Mazet investigation committee of the New York Legislature, on April 15th, Mr. Moss hinted at several dark transactions which he may or may not be able to trace directly to the Tammany chieftain. For instance, he referred to the project of John Jacob Astor and others to form a new telephone company and reduce telephone rates. Having asked the witness if a representative of Mr. Astor had called to see him about this company, and having been told that such might have been the case, Mr. Moss asked if it was not a fact that Mr. Croker had refused to give his favor to the new telephone company because he had been "seen" by representatives of the New York Telephone company. Mr. Croker denied this, and then Mr. Moss wanted to know if the witness had not made an agreement with Charles F. Cutler, president of the New York Telephone company, to show a special favor to the latter company for a period of five years in consideration of a certain fixed sum of money to be paid to Croker annually. The witness denied this, but the asking of the question created something of a sensation in the courtroom.

Mr. Moss began the attack by asking Mr. Croker if his turning down of the new telephone company was because the New York Telephone company had, after they heard of the matter, also opened negotiations with him. Mr. Croker said it was not, but an idea of the unhappy position into which Mr. Moss led him is best obtained from the following verbatim report of Mr. Moss' questions and Mr. Croker's hating answers:

Q.—Didn't you have any conversation about that time with the representatives of the New York Telephone company? A.—No, not that I know of. When was this all?

Q.—Well, I am asking you when it was. You recall it, when was it? Mr. Croker, these people called? A.—I cannot tell what date; there was some talk, there is talk every day, about 50 kinds of telephones.

Q.—Well, I will say was it within five years? Say it was within five years, and probably you can figure it out closer. A.—I remember there was some talk about telephone three or four years ago.

Q.—And the New York Telephone people came to you? A.—I don't remember that.

Q.—Don't you remember that the New York Telephone people found out about the starting up of the proposed new corporation? A.—I don't remember it.

Q.—Wasn't the matter mentioned to you? A.—I don't remember it.

Q.—You never had any stock in the New York Telephone company? A.—I decline to answer that.

Q.—Did you have any conversation with Mr. Cutler about these matters? A.—I don't remember.

Q.—Do you know Mr. Cutler? A.—I have seen him.

Q.—Who is he? A.—He is Mr. Cutler. (Laughter.)

Q.—What is his business? A.—I believe he is at the head of the telephone business.

Q.—At the head of the New York Telephone business; you knew him and had a talk with him? A.—Nothing particular that I know of.

Q.—But this was some time ago? A.—I have not talked with him anything in particular.

Q.—Did you receive any money from Mr. Cutler at any time? A.—Never. I decline to answer that question.

Q.—You have answered it, and then you take your answer back and decline to answer. A.—I know what you mean; yes, I decline.

Q.—Did you make an agreement with Mr. Cutler for the payment to you of money? A.—I decline to answer that question.

Q.—Did you not make a five years' agreement with Mr. Cutler for the payment to you of a sum of money each year? A.—I decline to answer that question.

Q.—Do you deny it? A.—I decline to answer that question.

Q.—Will you deny it? A.—I decline to answer that question.

Q.—Will you deny or affirm it? A.—I decline to answer that question.

Q.—Mr. Croker, if you took money or made an agreement to take money or had a contract for money from these telephone people, would you consider that an honorable or dishonorable act? A.—Dishonorable.

Q.—Did you do it? A.—I decline to answer the question.

Bonds of People's Telephone Company of New Orleans.

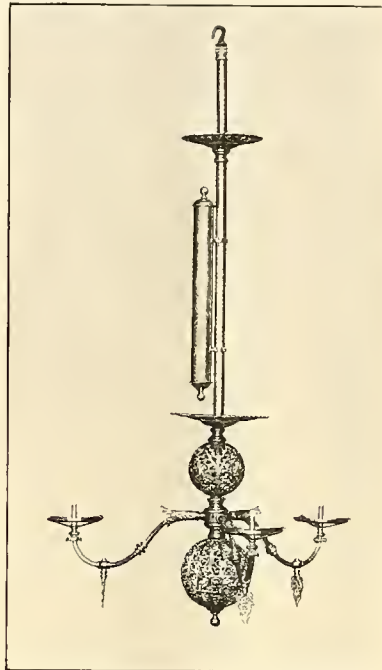
An issue of \$200,000 20-year first-mortgage six per cent. gold bonds, maturing in 1918, of the People's Telephone company of New Orleans, La., is offered at 105 and interest. The company operates under an exceptionally favorable franchise from the city. The bonds are secured by a mortgage on the franchise, contracts, equipment and entire property of the company. The mortgage authorizes an issue of \$300,000 of bonds on a plant of 3,000 telephone instruments. William P. Curtis, the vice-president and general manager of the company, says that the People's Telephone company of New Orleans has 3,000 subscribers, giving it an annual contract income of \$130,000. Its annual expenses are \$55,000, with six per cent. interest on \$300,000 bonds, \$18,000, and sinking fund, \$15,000, making \$88,000 altogether, and leaving surplus profits of \$42,000. The number of subscribers is rapidly and steadily increasing, and, it is said, will easily reach 4,000 within a year. The company has the enthusiastic support of the people and the municipal authorities. Thomas F. Ahern, who is consulting engineer for the company, adds: "In my 20 years of telephone experience I have never known a better telephone situation than in New Orleans. The construction work and equipment of the People's Telephone company is of the highest possible character. The system used is pure metallic, and the wires in the business section are in underground cables. The cost of maintenance is covered in the figures given in Mr. Curtis' letter. I regard the earning power as conservative, and believe it will increase." A part of the bond issue has been placed abroad.

Gas-lighting Specialties.

The Advance Specialty company of Chicago presents the new hand lighter for lighting gas by electric spark, which is shown in Fig. 1. The principal advantage of this lighter is its simplicity, as it does not use an induction coil or magneto, nor does it re-



of an insulating bar with heavy copper ends which make sliding contact in substantial jaws. The use of this fuse-holder enables fuses to be replaced with current on the box without danger of short-circuits. The Johnson & Morton boxes are made of standard width, regardless of the number of cir-



FIGS. 1 AND 2. GAS-LIGHTING SPECIALTIES.

quire any wiring, as by inserting the battery into the handle all necessary connections are made. The battery is of the dry form and will run the lighter for a long time without recharge. The lighter is constructed in fine style and is nickel-plated.

Fig. 2 illustrates a modification of the Advance Specialty company's attachment for electric gas lighting, to be fastened to gas fixtures, thereby dispensing with wiring the house. The new design is called the Little Joker. It is neat in appearance, easy to attach and connect and cheap. It is fastened to the fixture by two small rings, which are hinged so as to clamp the fixture rod, and only require two screws.

Johnson & Morton Junction Boxes.

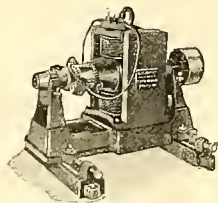
During the last few years the demand for well-made junction boxes has constantly increased, and with the view of meeting this demand Johnson & Morton, electrical engineers of Utica, N. Y., have placed on the market a line of boxes which is said to be giving very good satisfaction. A description of these junction boxes will prove of interest to prospective users, and the following details are given:

The tablet board containing the switches and connections of the boxes is removable and can be placed on the box after the interior finishing of the building and after all wiring is installed, thus preventing a possibility of damage to the finish of the visible parts of the box. As the junction box is the only part of a concealed-wiring installation which shows,

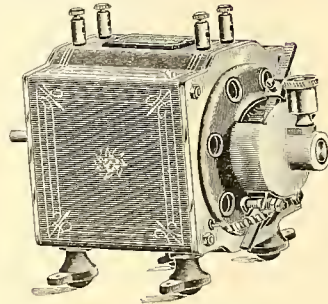
cuts, and are so designed that they will fit between the uprights in ordinary wooden buildings without any cutting. All copper work is highly polished and lacquered; the slate is enameled and polished after all drilling is completed, and the woodwork is highly finished by hand. They are, therefore, handsome in appearance, easily installed and connected up, and have received the approval of the National Board of Fire Underwriters.

Mayer Dynamos and Motors.

The cut shows the type of dynamos and motors manufactured by the Maxwell M. Mayer Electric



MAYER DYNAMOS AND MOTORS.



company, Second avenue and One-hundred-and-twenty-first street, New York. The machines are of the two-pole ironclad type, the whole magnetic frame being cast in one piece of open-hearth steel, which is bolted to a substantial iron base, which also

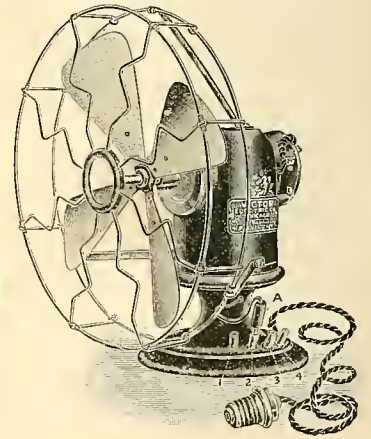
The armatures are of the slotted-drum type, finely laminated to avoid heating due to eddy currents. They are insulated with mica throughout, and the winding is such as to secure perfect electrical and mechanical balance. The carrying capacity of conductors is large, so that machines can stand considerable overload without injury. The commutators are tempered copper insulated with sheet mica. Carbon brushes are used in self-feeding brush-holders, and the tension on brushes can be changed at will. The mechanical construction is of the highest standard of excellence, all parts being heavy and the shafts running in self-oiling phosphor-bronze bearings. These machines are up-to-date, highly efficient, smooth running and noiseless, and will stand considerable overload without detriment. They are built in four sizes at present—one, two, three and five horse power. Every machine is provided with iron slide rails and underload automatic starting box for motors and field rheostats for dynamos.

The "S. J." Reflector.

A simple and neat reflector for incandescent lamps is shown in Fig. 1 of the accompanying illustrations. It is made by Schiff, Jordan & Co. of 232 and 234 Greenwich street, New York. The device, which is known as the "S. J." reflector, consists of an outer shade of silvered glass fitted with a base that screws into the lamp socket and an inner reflector of porcelain, that fits snugly over the lamp. The base of the lamp screws into a socket in the outer shade, this intermediate receptacle thus doing away with the necessity of a shade holder. Fig. 2 shows the lamp and the outer and inner portions of the reflector taken apart.

Victor Motors.

The Victor Electric company of 418 and 420 Dearborn street, Chicago, maker of the motors illustrated herewith, has been engaged in the manufacture of electrical specialties for about six years, during which time its business has grown steadily. The success of the company has been due to several causes. From the start the company has avoided the tendency to sacrifice quality to price. The aim has been, and is first to make the goods as perfect as possible, and next to sell them on as small a margin of profit as possible. The quality has been steadily maintained, and no misrepresentation of product has been tolerated. The company en-



FIGS. 1 AND 2. VICTOR MOTORS.

deavors to make its customers' interests its own, and gives prompt attention to all complaints. The Victor Electric company manufactures motors, batteries, rheostats, induction coils, electric dental engines, shunt boxes, electric air compressors, static machines, cataphoric obtunders, transformers, examination lamps, etc.

The shunt-wound motor shown in Fig 1 is of one-sixth horse power, and was especially designed for use where a high-grade machine for light power purposes is wanted. Danger of accidental damage is reduced to the minimum, as the motor is entirely encased in metal with the exception of the brushes, which are left exposed so that they may be readily adjusted and replaced. The most noteworthy feature is its noiselessness. When running at full speed it makes no perceptible noise. It is guaranteed absolutely for two years.

The Victor Electric company's fan motor (Fig. 2) embodies all the latest ideas in fan-motor construction. The company's aim has been to move a greater volume of air with less noise and a smaller current consumption than is done by the use of other fans, and, judging by the growth of the business and the commendations of customers, it has attained a high degree of success. The fan motors are artistic in design and finely finished; they are also substantially built and durable.

The War Department is inviting sealed proposals, until May 13th, for furnishing and installing electric-lighting plants at Fort Sumter and St. Helena Island, S. C. Prospective bidders can obtain full information upon application to the United States engineer at Charleston, S. C.

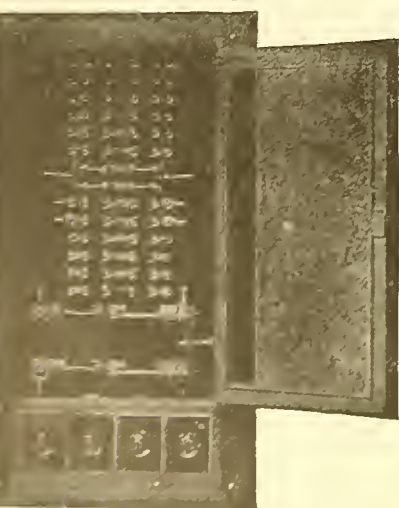
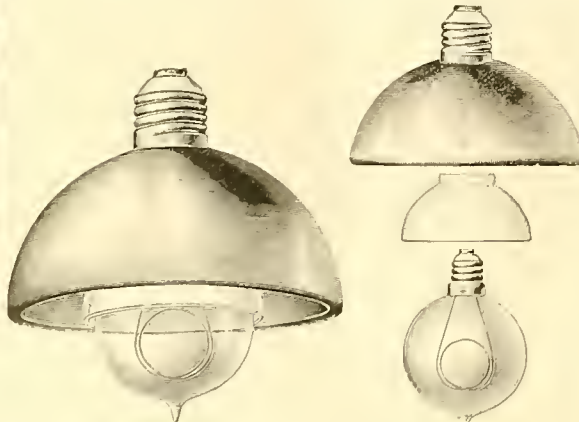


FIG. 1. JOHNSON & MORTON JUNCTION BOX.



FIGS. 1 AND 2. THE "S. J." REFLECTOR.

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Hatch Storage Battery.

The electrical trade in general and storage-battery buyers particularly will be interested to know that the Hatch Storage Battery company of Boston has just entered upon a most aggressive campaign in the exploitation of the Hatch cell.

For over a year this company has been husbanding its energies, so that its efforts and capital might not be wasted at an unfavorable period. But the great revival of trade in all lines during the last few months and the present outlook for the greatest prosperity, especially in the storage-battery field during the coming five to ten years, has brought the company's directory to the firm belief that the present is the time in which to let the public know the value of its product.

The Hatch Storage Battery company was organized

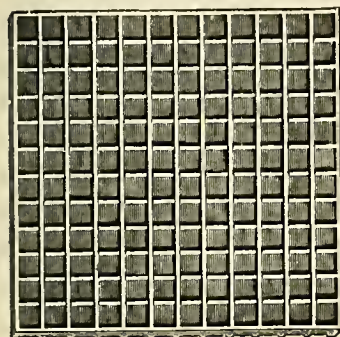


Fig. 1.

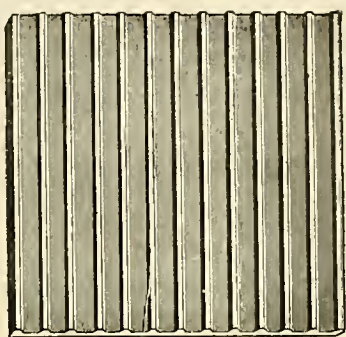


Fig. 2.

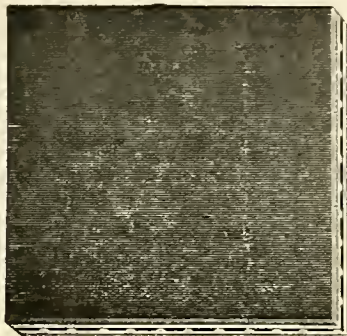


Fig. 3.

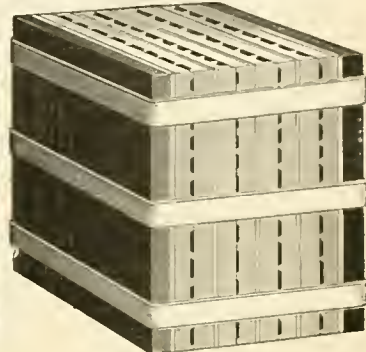


Fig. 4.

HATCH STORAGE BATTERY.

in May, 1897, and is at present officered by the following-named gentlemen: President, William S. Crosby; vice-president, Joseph Middleby, Jr.; secretary, Gorham H. Davis; treasurer and general manager, James P. Clare. The Hatch company is capitalized at \$500,000.

Relative to the technical features of the Hatch storage cell it should be explained that in its improved element there is no new chemical or electrical principle involved. The invention is of a purely mechanical nature, and relates to the construction of the element. The element is practically solid, and integral in all its parts, reducing the weight to the minimum amount of lead oxides necessary to do a given amount of work and for the mechanical support of light material, thus producing a storage battery of high efficiency, light weight, durability and compactness.

An examination of the construction of the Hatch cell will reveal how simply and effectually the oxides are locked up in their support, while they are also freely accessible throughout to the electrolyte of the cell.

The inventor had in mind the fact that the only materials in a storage battery which actually contribute to the storing of chemical energy are the metallic oxides and the electrolyte. To bring these two elements together, with a minimum of mechanical interference, was his thought and aim.

It is claimed by the Hatch company that the introduction of large masses of metal in the form of lead "grid" electrodes to serve as a mechanical support for the oxides introduces an element of danger,

internal resistance of the 100-ampere-hour cell is 0.0025 of an ohm, with other sizes in direct proportion, while the weight of the element to do a given amount of work is reduced fully one-third as compared with the grid type.

In constructing the Hatch element there is employed a porous plate of unglazed earthenware with square receptacles on its face side and grooves on its reverse side, as shown in Figs. 1 and 2. To the face side of each plate the lead oxide or active agent is applied, filling the mass one-eighth of an inch above the surface of the plates, so as to secure an agglomeration with the electrode during the forming process.

The plates thus loaded with the active agent are then placed together, back to back, with the grooves

crossed, as shown in Fig. 3. This forms one couple, positive and negative, of the element.

A series of these couples is then assembled, as shown in Fig. 4, to form the complete element, as many couples being associated as is necessary for the required capacity. The sides of this element thus assembled are flanked with a rigid support plate of glass, or similar material, and then encircled with heavy rubber bands, as shown in Fig. 4. The electrodes are then applied in any desired form, but ordinarily they are in the form of lead sheets, "interleaved" with the active material, as shown in Fig. 5.

Reference to Fig. 5 as a complete element will show how permanently the oxides are locked up, while the porosity of the entire mass is secured so that it will remain porous during the work, as the elasticity of the element allows for the expansion and contraction of the active material without closing the pores of its own mass.

Provision is also made for free circulation of the electrolyte between the plates, and, at the same time, allows a free escape of the gases formed by electrolysis.

As the first question asked by a prospective large investor in any particular storage battery would naturally be "Where have you a plant in operation, and how does it stand practical service?" the Braintree, Mass., plant of the Hatch Storage Battery company,

It is stated that the use of this storage-battery plant necessitates the employment of one less engine in the power station, equal to 1,250 horse power. The Braintree storage-battery installation is run at a cost estimated equal only to the interest on the cost of the battery. Such a plant speaks for itself.

The Boston Herald said of the plant illustrated. "From an economical standpoint it would appear that the results thus far obtained in the use of a storage battery by the Quincy and Boston Street Railway company have been highly satisfactory, and warrant its indefinite continuance. The company's first experiments led it to apply the battery to the entire Braintree system, which includes the Braintree, Holbrook and Randolph lines. The initial tests were watched with no little interest, as success meant a

big saving in operating expenses and a reserve supply of current that could be made available in case the power plant was temporarily crippled. Since the adoption of the battery the cars have been run at increased speed and at a saving of about 50 per cent. of the energy formerly employed."

In conclusion, as the question of infringement of patent rights in the storage-battery business has always been such a vital one, the Hatch company quotes from the legal opinion of Hon. Causten Browne as follows: "The question whether you (acting under the Hatch patents) can make and sell such batteries as are described in the Hatch patents without liability for infringement of the Brush patent is one to which I have given careful consideration, and I have come to the conclusion that the batteries described in the Hatch patents do not infringe the Brush patent. This Brush patent is the only one, so far as I know, in regard to which any question of infringement has been suggested. I therefore advise you that you may safely make and sell the batteries described in either of the Hatch patents, and practice the method described in the Hatch patent No. 585,472."

Electric Development in Brussels.

Something like American enterprise is suggested by the report of United States Consul Roosevelt

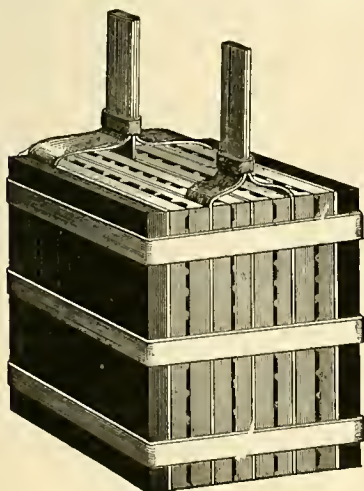


Fig. 5. Element Complete.

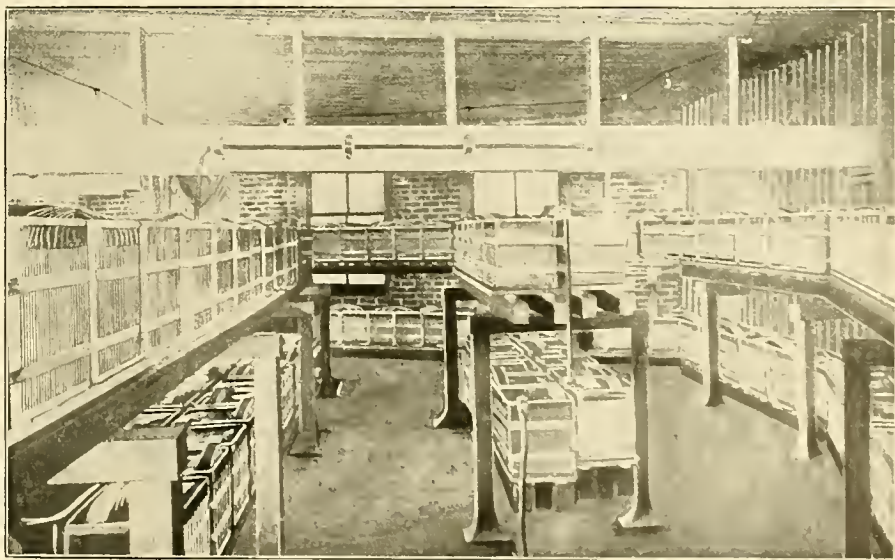


Fig. 6. Railway Station Plant at Quincy, Mass.

HATCH STORAGE BATTERY.

because of the traces of foreign metals in all lead, which, in the past, it is stated, have had much to do with the poor work of storage batteries and added unnecessary weight.

The electrical efficiency of a storage cell is determined primarily by its internal resistance, and this, in its turn, is governed by the freedom from interference with its chemical and electrical operation. Purity of material, with a minimum of the mechanical parts, and porosity of the active agent and its mechanical support, to admit of the free distribution of the electrolyte, are the essentials.

The construction of the Hatch element, the company feels, secures all these points perfectly, as the

shown in Fig. 6, installed for the Quincy and Boston Street Railway company, stands out pre-eminent as a sample of this company's work, although other installations of similar importance can be shown.

The Braintree plant consists of 200 cells of the Hatch battery, possessing 550 ampere-hours capacity. This equipment is used as an addition to aid a booster system supplying the Braintree street railway. This road gives service to about 20 cars in summer and about eight cars in winter, and it is 15 miles long. The booster is located at Quincy Point, seven miles from Braintree. This plant was started about May 1, 1898, and the Hatch company reports that it has been running since without the slightest hitch.

upon the development of the electrical interests at Brussels. Statistics show that in 1893 3,030 lamps met the requirements of consumers of electricity in the city of Brussels. At the present time there are 66,000 lamps. In consequence of the constantly increasing use of electricity, the city has been obliged to enlarge its plant, and it is now proposed to buy five new vertical machines of 1,000 horse power, to be placed in works already supplied with five horizontal machines of 500 horse power each. The city has another station in the basement of the railroad building, but, owing to the steadily increasing use of electricity, the production is insufficient to meet public demands.

Sale of Fort Wayne Property.

The Fort Wayne Electric corporation's plant and other property were purchased by the General Electric company at the receivers' sale on April 18th. The sale was held at Fort Wayne and occupied the entire day. Representatives of the General Electric company, the Siemens & Halske company of Chicago and of the Fort Wayne Emergency company were present. The General Electric company's representatives were Mr. Coffin, president and general manager; Mr. Parsons and Mr. Durstin, eastern legal representatives, and Attorney-general Taylor of Indianapolis. Mr. C. S. Knight of the Siemens & Halske company was present, and most of the Fort Wayne capitalists who had been interested in the effort to keep the ownership of the works in the city were also on hand.

The receivers' inventory divided the property into three classes; the first, including real estate, patents and equipment, was scheduled at \$207,261.89; the second, being merchandise, was placed at \$145,954.67; and the third, being real estate, furniture, machinery and tools, securities, etc., was estimated at \$181,245.18; total, \$534,461.74.

An attempt to dispose of the property as inventoried failed, and then it was decided to sell the entire property.

Mr. Coffin submitted the following proposition in writing, which was accepted, no other bids being presented:

"The General Electric company bids the sum of \$356,400 for the entire plant of the Fort Wayne Electric corporation, of which sum \$185,000 is to be paid for with \$185,000 at par value of the debenture bonds of the Fort Wayne Electric corporation, which bonds are owned by said bidder, and are the same bonds provided for in the decree of the United States District Court of the District of Indiana, in the order of sale of said property; the balance, amounting to \$171,400, to be paid according to the terms of the decree.

"This bid is conditioned that this purchaser shall receive all of the plant and property of every kind and description whatsoever of said Fort Wayne Electric corporation, ordered to be sold by said decree and order of sale, free and clear from any liens and claims of the receivers, and receivers' certificates, and also free from all other liens, encumbrances, claims of creditors and debts whatsoever."

From the sum realized from the sale, \$356,400, the following obligations must be met at once:

General Electric company.....	\$185,000
Receivers' costs	42,000
Charles A. Wilding, trustee.....	30,000
Court costs, etc. (approximately).....	20,000

Total

\$277,000
Subtracting this amount from the proceeds of the sale, leaves \$79,400, to which must be added collectable outstanding accounts aggregating approximately \$65,000 and \$8,000 in the hands of the receivers, a total of \$153,400, which amount will be disbursed to the unsecured creditors. The total unsecured indebtedness is \$900,000, so that the payment will aggregate about 16 per cent. of the total claims.

Representatives of the interests involved will bring the matter before Judge Baker of Indianapolis at once for approval.

Mr. Coffin encouraged the Fort Wayne people to hope for continuance of the plant in that city, it was said, and it was announced that the works would be reopened on Monday morning under the direction of J. J. Wood as superintendent and F. S. Hunting as purchasing agent.

Much disappointment was shown by the people of Fort Wayne with the result of the sale.

It is said that Henry C. Paul and Charles S. Bash will act as financial representatives of the General Electric company at Fort Wayne.

CORRESPONDENCE.

New York Notes.

New York, April 17.—Richard Croker, the Tammany leader, was subjected to a searching examination by the Mazet legislative investigating committee last week. He was asked many pointed questions about his relations with corporations doing business with the city or by municipal franchise, such as the Manhattan Railway company, the Metropolitan Street Railway company and the New York Telephone company. He refused to answer a large proportion of the questions, on the ground that he was not compelled to divulge his private affairs. He said that he had speculated in the stocks of various companies, but would not admit that in his position of dictator of the all-powerful Tammany organization he had tried to influence the market value of stocks to his own profit or that he had taken money from quasi-public corporations for furthering their interests. Nevertheless, Mr. Croker's answers to the questions put to him and his demeanor as a witness were so unsatisfactory and evasive, when not shamelessly explicit about the finances of the "organization," that the belief is general that there must be a large proportion of truth in the stupendous charges made against him.

Several hundred men—engineers, railroad men, electricians and others—witnessed a test of Captain J. McLeod Murphy's safety third-rail electric-railway system at Manhattan Beach on Wednesday

last. The test was made on 2,000 feet of track which connects the Manhattan Beach Hotel with the Oriental Hotel. It seemed to be the general opinion of those who witnessed the demonstration that the new system promised success.

A trial was made yesterday of one of the compressed-air motor cars to be used on the cross-town routes of the Metropolitan Street Railway company. After an examination of the mechanism at the compressor house at Twenty-third street and Eleventh avenue, one of the cars was run across town on Twenty-third street to the East River and back. In the car were several officers of the Metropolitan and American Air Power companies. Twenty of the new cars are now ready for use, and will be put into service on May 1st on the Twenty-eighth, Twenty-ninth and Thirty-fourth street lines.

In relation to the statement that William C. Whitney was interested, with the Auto-truck syndicate, in the acquisition of certain interests in Springfield, Ohio, Mr. Whitney said to a New York reporter: "The statements contained in the dispatch are not true. My name has, from time to time, been associated in the public press with a company known as the Auto-truck company. You may say that I neither have, nor have had, at any time, any interest in the company, nor do I know anything about its organization, property or affairs. The confusion arises from the circumstance that the Metropolitan Street railway owns a large interest in the American Air Power company—a corporation entirely distinct from the Auto-truck company—and has spent a large amount of money developing the system, as applied to surface railways. We believe the city of New York will soon realize the benefits to be derived from a new power on surface railways, in the use of which no tearing up of the streets is required. We have spent at least three years and the greater part of \$1,000,000 in experiment and development, which we now believe will prove entirely successful."

At the recent commencement exercises of the New York Trade School certificates of merit were awarded to 24 pupils in electrical work. This was out of a total of 310 certificates.

There seems to be little doubt that the "Whitney crowd" on the one hand and the affiliated Manhattan and Third avenue companies on the other are dicker with the owners of the United Electric Light and Power company for the purchase of it. If the Metropolitan people could get the United company, which is a Westinghouse company, they would, through the New York Gas and Electric Light, Heat and Power company, largely control the electric lighting of the city, having already taken over the Edison Electric Illuminating company. Their great rivals, the Manhattan-Third Avenue capitalists, are naturally opposed to this. Both parties are, therefore, in the field as purchasers of the United company, if a price can be agreed upon. The United Electric Light and Power company has a large plant at Twenty-ninth street and the East River and other stations. It distributes, at time of maximum load, about 10,000 horse power in electrical energy, using the alternating-current system.

After a meeting of the Board of Rapid Transit held to-day, at which the officers and counsel of the Metropolitan Street Railway company were present, it was practically decided that the proposed underground rapid-transit railway will not be built by that company. The meeting was hurriedly called, and followed upon a statement made by Governor Roosevelt, in Albany, that he earnestly hoped for the passage of the rapid-transit bill, but that he was opposed to granting franchises in perpetuity and for more than 50 years. William C. Whitney, Harry Payne Whitney, H. H. Vreeland, Thomas F. Ryan, Elihu Root, counsel, and Henry MacDonald, sub-counsel for the railway company, met the rapid-transit commissioners. At the direction of Mr. Whitney a letter was addressed to the commissioners, saying that in view of the objections raised the Metropolitan people "feel constrained to withdraw their proposition to build the underground rapid-transit railroad."

Speaking of the very recent acquisition of the Kings County elevated railroad by the Brooklyn Rapid Transit company, ex-Governor Flower made this statement a day or two ago: "This secures for the Brooklyn Rapid Transit company all the elevated roads in Brooklyn and all the trolley lines save one. The officers of the Rapid Transit company estimate that the saving in operating expenses alone through consolidation will be equal to four per cent. on the stock. Since April 1st the earnings of the entire system have shown an increase, on an average, of more than \$3,000 a day as compared with last year, and it is expected that with the summer traffic in full swing the increase will be more than \$5,000 a day, adding net earnings equal to one or two per cent. on the stock." A story has recently been circulated to the effect that an arrangement between the Rapid Transit company and the Manhattan Railway company, which owns the elevated railroads in Manhattan, is under consideration, whereby trains may be run from Harlem and the Bronx across the Brooklyn Bridge and clear to Coney Island and Manhattan Beach. In any event, it is reported that there will be a transfer agreement between the Brooklyn Rapid Transit and the Manhattan company similar to that which is to go into effect on May 1st between the Manhattan and the Third Avenue Railroad company. M. S.

Canadian Intelligence.

Ottawa, April 15.—Mr. Emerson has received from McGill University, Montreal, a report of the result of a test of his scheme for the manufacture of calcium carbide from sawdust. His method is acknowledged as the only means in existence by which sawdust can be converted properly into carbon. The scheme will be supported.

An important real-estate deal has been put through by the Shawinigan Water and Power company of Montreal, which will enable the company to go ahead with the development of the power at that place, which will only be exceeded in extent by the big plants at Niagara. Contracts for the work of developing the water power will soon be given out by the company.

The Ottawa Electric company has begun extensive improvements in its power at the Chaudiere Falls. New buildings and heavy machinery will be added. A new flume will also be built which will be 20 feet wide and will be closed in on one side by a cut of solid rock and on the other by an immense stone wall. It is expected that by the company's method of controlling the water flowing into the flume anchor ice will be avoided.

The Bronson & Weston company's lumber mills in Ottawa are about to be converted into an immense carbide factory. The factory will be operated by a 4,800 horse power electric plant.

The Dominion government has decided to construct a telegraph line to connect the Yukon with British Columbia. A party of engineers has left Ottawa for the Pacific coast with instructions from the government to commence at once the construction of the line from Skagway to Dawson City. The estimated cost of the line for the distance of 600 miles between the two points named is \$150,000, on a basis of \$250 a mile. It is expected that the line will be in operation by the 15th of November next, and when it is completed Dawson will be brought within six days' communication of Ottawa.

Captain G. H. Couvrette of Montreal, who has had 20 years' experience on grain-carrying ships between Duluth, Chicago, Buffalo and Kingston, has patented an electric grain shovel, to be worked in connection with the floating elevators now in use in Montreal harbor. By the use of the electric shovel, it is claimed that grain can be transhipped in less than half the time it has taken heretofore, and for at least one-third less than it costs to tranship grain at Ogdensburg, Prescott, Kingston or Buffalo.

The Metropolitan Electrical company of Ottawa, organized for the purpose of supplying electric lighting and motive power to Ottawa and the surrounding district, which includes many growing and prosperous towns, has just issued its prospectus to the public. The company has already been incorporated, and the authorized capital stock is placed at \$500,000, in shares of \$100 each. Thomas Lindsay of Ottawa is the president of the company. It is confidently believed that the new company will be successful from the outset, and as Ottawa, with its immense water-power advantages, is fast becoming a chief manufacturing center of the Dominion, the prospects for future development are exceptionally bright. The company will obtain its water power from the Deschene Rapids, near Britannia, about six miles from the city.

An invention has recently been perfected in Ottawa which, it is said, may take the place of the now much-used electric bell, and will also no doubt be extensively used as a fog signal at sea and along the shores where the fog signals are in use. The machine will be known as an electrical siren. The inventor of the new device is A. E. Trudeau of Ottawa. He has been working steadily for over two years on this invention, and has just completed a large fog horn, which will be tested on the great lakes as a fog signal. The machine is capable of producing a variety of sounds similar to those of a steam whistle, and can be heard at a great distance. The sound produced is very harsh and penetrating. It can be placed at a point inaccessible to an ordinary steam plant now used in fog signaling, and can be operated by wires connecting the power at almost any distance. It is also proposed to utilize it as a burglar alarm. The mechanism of the new machine is very simple and compact. It consists of a large copper horn, similar to that of a large base horn. The remainder is of iron. The sound is produced by the vibration of a diaphragm at the base of the horn, similar to that of a telephone, but on a much more extensive scale. The electric current as soon as turned on produces the sound. This new device, it is expected, will be adopted by the Dominion government to take the place of the rather cumbersome steam plant required for signaling stations. W.

PERSONAL.

Mr. Weare Parsons of Chicago has been appointed superintendent of the Southwest Electric Light and Power company at Joplin, Mo.

Mr. Shepherd A. Benson, for many years connected with the General Electric company in Denver, has been placed in charge of the Salt Lake office of that company.

Mr. I. C. Woodard, a well-known electrical man of San Francisco, was in Chicago last week. Mr. Woodard is returning to his home in California after an extended eastern trip.

ELECTRIC LIGHTING.

An electric-light plant, to be operated by water power, will be erected at Anstell, Ga.

The secretary of the treasury is inviting sealed proposals, until May 24, for installing an electric-light and power plant in the United States courthouse and postoffice building at Kansas City, Mo. Proposals from actual manufacturers only will be received. Specifications and plans can be obtained upon application to the Treasury Department, Washington, D. C., or of the superintendent of construction of the building at Kansas City, Mo.

ELECTRIC VEHICLES.

One of the principal features of next month's electrical show in Madison Square Garden, New York, will be the display of electric vehicles. The Pope Manufacturing company of Hartford, Conn., the Riker Electric Motor company of Brooklyn and the Woods Moto-vehicle company and the American Electric Vehicle company of Chicago have all secured choice exhibit spaces in the central part of the hall.

The London Standard says that the motor industry of Great Britain is active, and its future appears bright. There is a brisk call for motors. A traveler who recently arrived in Coventry from a continental trip brought back an order for one hundred, and he said that in France especially the demand for mechanically propelled vehicles is keen. Improvements are being made weekly, while remarkable speeds have already been recorded on long journeys. At present the cost is prohibitive to the great majority, but the possibilities of development for business purposes are not limited.

The Illinois Electric Vehicle company has been organized in New Jersey by a strong eastern syndicate, said to include William C. Whitney, Messrs. Elkius, Widener, Ryan, Rice and others interested in electric and transportation affairs. Substantially the same people own the electric-vehicle company in New York and in the New England states. The general plan is that the local companies operate electric cabs and other vehicles manufactured under patents controlled by the promoters. The same interests have lately acquired the Electric Storage Battery company of Philadelphia, and the chief owners of that company also own the Chicago Electric Traction company's storage-battery road in Englewood.

Consul-general Gowdy sends from Paris a synopsis of the regulations for the circulation of automobiles as follows: Every type of vehicle employed must offer complete conditions of security in its mechanism, its steering gear and its brakes. Each vehicle must bear the name of the constructor, the indication of the type of machine, the number of the vehicle in that type, and the name and domicile of its owner. No one may drive an automobile who is not the holder of a certificate delivered by the prefect of the department. In narrow or crowded thoroughfares the speed must be reduced to walking pace. In no case may the speed exceed 30 kilometers (18.6 miles) an hour in the open country, or 20 kilometers (12.4 miles) an hour when passing houses. The approach of an automobile must, if necessary, be signaled by means of a trumpet. Each automobile must be provided with two lamps—one white, the other green.

MISCELLANEOUS.

The Chicago offices and laboratory of the Electrical Bureau of the Board of Fire Underwriters have been removed to No. 67 East Twenty-first street, Chicago, to which location all future communications should be addressed.

TRADE NEWS.

Hollister Bros., 148 Monroe street, Chicago, printers and publishers, are installing a number of the Western Electric company's motors in their press-room.

The secretary of agriculture is inviting sealed proposals, until May 4th, for furnishing the department with telegraph supplies during the next fiscal year. Full information will be furnished upon application to the department, Washington, D. C.

The Advance Specialty company of Chicago reports large sales of its electric specialties. The company was pressed for room in its old quarters, and has removed to suite 42, No. 119-121 La Salle street, where it will be pleased to meet its friends and customers.

Sealed proposals are invited, until May 10th, for furnishing the office of public buildings and grounds in Washington with electric-battery supplies during the fiscal year ending June 30, 1900. Information can be obtained upon application to Colonel Theo. A. Bingham, Washington, D. C.

F. A. La Roche & Co., 652-660 Hudson street, New York, have purchased the plant and stock of

the Murphy Switchboard company, manufacturer of switchboards and panel boards, and the business will be hereafter operated in connection with the various other activities of La Roche & Co.

The W. H. Sills Mica company of Chicago reports a large business. The trade of the Sills company has enjoyed a phenomenal growth, and the concern is now receiving orders from all over the world. The Sills company handles only the best quality of mica, which may account for its constantly increasing output.

The Sioux City (Iowa) Brass Works have passed from the possession of a receiver to the Hawkeye Electric company, which does an electric power and lighting business. The name of the Sioux City Brass Works will be retained for the products of the brass foundry and machine shop, although the ownership has passed to the Hawkeye company.

Sargent & Lundy, the well-known electrical engineers of Chicago, will remove to 1140 Monadnock building, where the firm will enjoy much more commodious quarters. Sargent & Lundy have been identified with some of the largest electrical and mechanical installations in the West, and the firm is now working on a number of plants which require the best engineering skill.

Another evidence of the tendency of hardware dealers to go into the electrical supply trade is furnished by the announcement of the Smith & Egge Manufacturing company of Bridgeport, Conn., that it has added an electrical department to its business. This company has secured from the O. S. Platt Manufacturing company of Bridgeport the exclusive right to manufacture and sell the New England switches. The Smith & Egge company expects, also, to make a line of knife switches, and may add other specialties.

Correspondence instruction in technical subjects was instituted, it is claimed, by the International Correspondence Schools of Scranton, Pa., and its students and graduates, which are said to number more than 80,000, have ranked with students and graduates of other technical schools. The schools teach mechanical, electrical, steam and civil engineering, mechanical and architectural drawing, architecture, plumbing, English branches, bookkeeping, etc., having more than 50 courses. Students may study at home, devoting such time as they can spare, and the instructors are in constant communication with them through the mails.

Walter R. Weldon, an electrical man of Fort Wayne, Ind., has invented a new form of pipe covering that is said to be an insulator against electricity as well as against heat. This covering is cheap, and it is claimed to have all the advantages of usual steam-pipe coverings with the additional one of providing an easy method of insulating buried metal pipes from the escaping current of street railways. Mr. A. L. Hadley of the Fort Wayne Electric corporation writes: "I have tested a sample of pipe covering submitted by W. R. Weldon, submitting it to a pressure of 10,000 volts alternating current, with a maximum pressure of 14,000 volts. The sample tested is seven-eighths of an inch thick, and would require from 20,000 to 50,000 volts pressure to pierce the material of that thickness. The material is a very good insulator, and as long as it is kept dry, free from moisture, or with a coating of japauning material or asphaltum paint to make it waterproof, it would, without doubt, successfully protect iron or other pipes from street-railway currents."

BUSINESS.

The Electric Appliance company is distributing its 1899 fan-motor catalogue, which is a very satisfactory publication. The catalogue includes a full list of alternating and direct-current desk and ceiling fans, together with some other fan specialties. The company will be pleased to furnish copies to the trade and quotes especially attractive prices.

Lamp users desiring to realize on burned-out lamps should communicate with Goldsmith Bros., 63 Washington street, Chicago, who pay the highest market value for old lamp bases containing platinum. This firm also buys platinum scrap and places on the market an excellent line of platinum wire. The firm has been in this business for many years and is well known to the electrical fraternity, with which it is doing a large business.

The Western Electric company, in its manufacture of fan motors, not only has the armatures perfectly balanced, but also weighs the fan blades and inspects and balances the fans independently of the motors before assembling. This careful attention to details is one of the features which make the Western Electric fan motors so efficient. The 40-page fan-motor catalogue describing the various makes

of fans should be valuable to those who are interested.

The small, well-known Porter motors are made by Kendrick & Davis, Lebanon, N. H., successors to the Porter Standard Motor company. They are made to run on primary-battery circuits or, with suitable resistance, on 110-volt direct-current circuits. They are suitable for driving toys, advertising devices or fans. For amateurs the Ajax fan is supplied in parts, ready for assembling. A neat catalogue is sent by Kendrick & Davis on application.

The Charles E. Gregory company of Chicago, the well-known dealer in second-hand electrical apparatus, reports a large and increasing business. The Gregory company always carries a large assortment of every character of second-hand electrical apparatus, and there are few, if any, calls for apparatus made on the company that cannot be filled. Through the energetic efforts of General Manager A. Louis Kuchmstedt and his associates the company has built up an enviable reputation, and no dealer in second-hand apparatus is better known than this wide-awake concern.

An attractive souvenir is distributed to the electrical trade by the Becker Name Plate company of Boston in the form of an aluminum paper-cutter and envelope opener. Six cents* in postage stamps will bring this to anyone interested. Manager August Becker is a believer in novel advertising, and the practically free distribution of this souvenir is but one of the many ways he has of increasing a rapidly growing business. Mr. Becker has had 18 years' experience in the engraving and casting of bronze name-plates, and he now enjoys the patronage of a large number of the best concerns in the electrical field, both in the United States and Europe. Orders have recently been received, one for 5,000 plates, one for 2,000 plates, in the United States, and one for 1,000 from a large London house. Mr. Becker is now making a special effort to secure western trade, and his excellent work seems to entitle him to a large share.

W. N. Matthews, 312 Commercial building, St. Louis, is meeting with good luck in the sales of his large lot of second-hand machinery on hand in St. Louis. Mr. Matthews is also successful as a manufacturer's agent, and, as he recently expressed it, the way orders are coming in for Paiste specialties in the Southwest is a "sort of barometer of the times." Mr. Matthews was recently in New York, and since that time has made a trip to Kansas City, New Orleans, Memphis and Louisville, and had a good business all along the line. As a general agent for the Ritter soldering iron he has been most successful. From the gossip of electrical circles it may be assumed that Mr. Matthews will soon secure several valuable agencies from the East in addition to those he has. His reputation as one of the brightest young men in the supply trade of the Southwest seems to stand him in good stead.

Among other well-known goods which the Western Electrical Supply company of St. Louis, Mo., is offering to the trade are the telephone switchboards made by the Western Telephone Construction company. The Western Electrical Supply company has only recently taken the agency for this board, but has made an excellent start and anticipates a large demand, owing to the long-established and well-deserved reputation of this switchboard. The Western switchboard is at the present time in use in some of the largest independent telephone exchanges in the country. It is fully covered by broad patents controlled by the Western Telephone Construction company. Its numerous points of merit have met with universal favor throughout the country, judging from the number of boards in use. The Western Electrical Supply company will be pleased to furnish estimates on this switchboard to anyone anticipating the installation of a telephone exchange.

The American School of Correspondence of Boston has been most successful in imparting to engineers and mechanics a thorough knowledge of the theory and practice of their profession by means of a thoroughly up-to-date system of instruction by correspondence. The courses are limited strictly to steam, electrical and mechanical engineering, and, as these courses have been prepared by well-known educators and experts, the courses are complete, accurate and thoroughly abreast of the times. The courses all begin with the simplest mathematics, and the student is gradually advanced to the more difficult subjects, as designing boilers, engines, dynamos, electrical measurement, etc. The school is chartered by the commonwealth of Massachusetts, and, as its chief aim is to benefit the ambitious workman, the tuition is placed very low in order that every mechanic may secure the technical knowledge necessary for advancement in his profession. The school will gladly send a handbook to any address on request.

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued April 11, 1899.

622,657. Circuit-breaker. Hjalmar E. Andersson, Stockholm, Sweden. Application filed February 14, 1899.

A circuit-breaker comprising two superposed tubes containing mercury, and an insulator consisting of a plate of

insulating material movable between the tubes to divide the body of mercury, in combination with a vessel containing an oleaginous liquid in which the proximate ends of the two tubes and the cut-off plate are immersed, and means for connecting the mercury at opposite sides of the cut-off plate respectively with opposite poles of an electric circuit.

622,660. Battery Cut-out for Electric Selector Systems. Thomas C. Drake, Malta, Ohio. Application filed February 17, 1898.

In this mechanism there is the combination of an electro-magnet to energize an armature lever, the armature

lever adapted to release and stop an impelled and retarded escape wheel, means to impel the escape wheel, a stop-catch carried by the armature lever to stop the escape wheel and make electrical connection therewith when the armature lever remains in normal position, a stop-catch electrically insulated from the first stop-catch and adapted to stop the escape wheel and break electrical connection therewith when the armature lever is in an energized position.

622,689. Process of Making Battery Electrodes. John C. Howell, London, England. Original application filed July 8, 1898. Divided and this application filed January 3, 1899.

The process of producing battery plates or electrodes which consists in first spirally cutting a metallic tube in the direction of its length and then securing the continuous ribbon so produced upon or to a core or frame.

622,690. Machine for Making Metallic Ribbon for Battery Electrodes. John C. Howell, London, England. Application filed January 3, 1899.

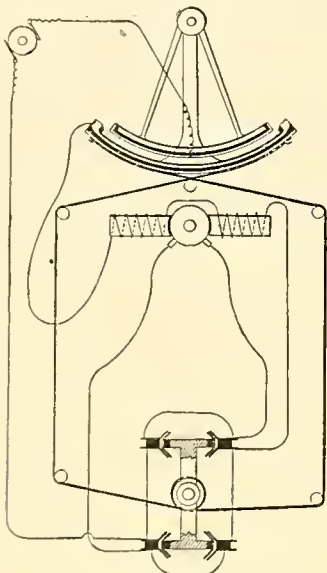
Apparatus is described for the manufacture of metallic ribbon comprising mechanism adapted to cut a metal tube of a mandrel having both a rotating and a receding motion with relation to the tube and adapted to collect and spirally wind the ribbon so produced.

622,736. Electric Overhead Railway. Jean B. Verroken, Antwerp, Belgium. Application filed May 24, 1898.

In an electric overhead railway there is the combination with suitable supports and cables and suspension rods of rails formed of a horizontal plate carrying an electric conductor by means of insulators, and furnished on the upper face with two vertical partitions between which are arranged the suspension rods furnished with a head at their lower ends to carry the rail.

622,747. Splicer for Trolley or Other Wires. Mont-traville M. Wood, Chicago, Ill. Application filed November 2, 1898.

A splicer for trolley or other wires comprising a tubular casing tapered in internal diameter and a splicer cap closed at one end arranged within the casing, the cap also tapering externally and adapted to receive in the open end thereof the end of the wire to be spliced, the end of the wire adapted to abut against the solid end wall of the cap.



NO. 622,977

622,748. Rheostat. William H. Woodman, San Francisco, Cal. Application filed November 17, 1898.

In an apparatus for affording electrical resistance an outer casing in combination with an inner frame having a movable member, a resistance supported by the frame so as to draw upon the movable member, springs bearing upon the movable member in opposition to the tension of the conductor, electrical connections and a switch for controlling the resistance.

622,759. Electric-arc-forming Device. Josef Czifowski, Vienna, Austria-Hungary. Application filed November 29, 1897.

This device consists of a body of metal readily fused or dissipated by the electric current, being suitably shaped to fit upon or conform to the opposing tips of two aligned carbon electrodes of an electric arc lamp and maintain them against lateral displacement while serving to establish the arc when the electrodes are connected in circuit.

622,785. Electric-light Radiator. Henry Stenz, Fair-vaux, Minn. Application filed March 26, 1898.

A globe for electric arc lamps comprising upper and lower frames of different size, and integral globe sections crimped or corrugated and secured between the frames, and having the end portion adjacent to the smaller frame contracted.

622,805. Apparatus for Line Distribution by Inductional Transformers or Secondary Generators for Electric Railway. Elias E. Ries, Baltimore, Md. Application filed December 30, 1887.

A system of electric propulsion comprising a series of spaced electric circuits extending along a railway, traveling motors fed from the working circuits, and inductional transformers charging the working circuits and charged from a main line.

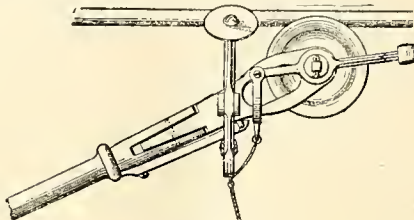
622,866. System of Electrical Distribution. Charles F. Smith, Pittsburgh, Pa. Application filed November 4, 1898.

A system of alternating-current electrical distribution for single and polyphase transmitting devices comprising three or more conductors, a source of two-phase currents and

a transformer connecting one of the line conductors with the other two line conductors through the source of current and so proportioned as to equalize the line electro-motive forces and adjust the phase relation thereof.

622,885. Circuit-breaker. Harry P. Davis, Pittsburgh, Pa. Application filed November 4, 1898.

A circuit-breaker is described comprising two hinged-connected members, one of which has contact pieces, in combination with stationary circuit terminals, the heads of which are in position to be engaged by the contact pieces and with means for so supporting the circuit-breaker as to prevent downward or lateral displacement, but permitting ready removal when moved upwardly.



NO. 622,991.

622,893. Electric Igniter for Gas Engines. Ernest W. Graef, Baltimore, Md. Original application filed November 29, 1897. Divided and this application filed June 23, 1898.

An electrical contact device is located within the combustion chamber, an oscillating shaft projecting through the wall of the chamber for operating the same, the shaft and one pole of the contact device being connected to a source of electricity, the shaft upon the exterior of the chamber being provided with a crank, a pivoted lever connected to the crank by a joint having some lost motion, and a spring connected to and operating the second lever, means for actuating the spring lever to move it and its connections to make a contact and then to bend and release it, the spring by its recoil actuating the connecting parts to break the contact.

622,910. Electrically Illuminated Advertising Sign. William T. Bell, Nottingham, England. Application filed February 2, 1898.

An apparatus for operating electrically illuminated signs and the like comprises a switchboard provided with a series of depressible contact pins, one for each lamp, a jacquard pattern card having in it apertures which register with a part only of the contact pins, a carrier for the pattern card adapted to be moved toward and from the switchboard, the carrier having apertures registering with all of the contact pins, and means for moving the carrier and guiding it in its movements.

622,917. Electric Temperature Indicator. John H. Dorion, Springfield, Mass. Application filed May 31, 1898.

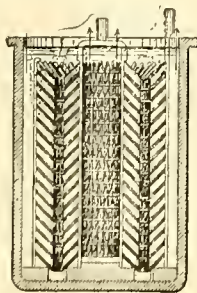
A temperature-indicating device has suitable metal posts forming the terminals of two electric circuits, each of which includes a source of electricity and an electric alarm bell; a movable metallic connection for closing the circuits, means for effecting the contact of the metallic connection with the posts, and two connections having different fusing points for normally holding the metallic connection out of contact with the post, whereby one of the circuits will be closed in advance of the other.

622,977. Electrical Steering Mechanism. Andrew L. Riker, New York, N. Y. Application filed May 23, 1898.

In an electric steering device a motor in operative connection with the rudder, a source of electrical energy included in a circuit with the motor, a reversing switch in the circuit and a second switch in the circuit, one member of which is mounted upon and moves with the rudder-head, whereby the movement of the rudder serves to automatically open the switch.

622,991. Trolley. Robert E. Carroll, Lima, Ohio. Application filed November 19, 1898.

The invention includes a trolley pole and a trolley wheel support on the upper end thereof, arms pivotally mounted on the opposite sides of the trolley wheel support below and in advance of the trolley wheel, and provided at their upper extremities with angularly arranged guide and concavo-conical guard disks arranged in front of the trolley wheel and operating to hold the latter to the line wire, and means for spreading the upper ends of the arms apart to disengage the disks from the line wire.



NO. 623,104.

623,006. Flexible Electrical Conductor. John W. Gottschalk, Philadelphia, Pa. Application filed February 8, 1899.

A braided conducting cord is made in continuous lengths, having enlargements at intervals formed by increasing the thickness of the covering.

623,009. Fire Alarm. Harlie E. Greene and John W. Haaly, Hot Springs, Ark. Application filed January 3, 1899.

The flanged and screw-threaded sleeve and nut clamp the wall of the inner case between and form an elongated passage way, the headed pin and a spring-actuated push-button bearing an inclined surface rest beneath the pin. The push-button has a range of movement at right angles to the pin.

623,022. Electric Catheter. Reason P. Johnson, Chicago, Ill. Application filed March 30, 1898.

In a catheter the combination with a flexible tube having a closed end or tip and lateral apertures of a helical wire coil within the tube, means for attaching such coil to a terminal of an electric circuit, and means for connecting the tube with a source of liquid supply.

623,033. Lightning Conductor. Gustav Raunacher, Vienna, Austria-Hungary. Application filed January 20, 1899.

In a lightning arrester a head having a central rounded surface and a plurality of points surrounding the same.

623,036. Carbon-sorting Machine. Charles T. Richmond and Mahlon M. Zellers, Cleveland, Ohio. Application filed March 26, 1898.

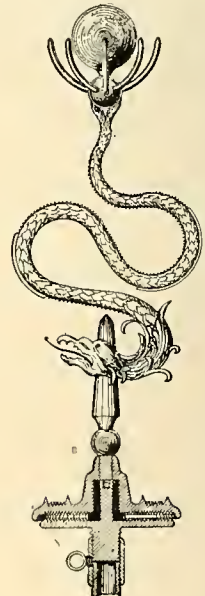
An important feature is a rotating chuck for holding a carbon, and is connected with one terminal of an electric circuit, and a contact plate in the described relation to a carbon in the grasp of the chuck, the plate being connected to the other terminal of the chuck, and means for adjusting the position of the plate relative to the axis of the chuck.

623,063. Apparatus for Measuring and Recording Electric Currents. Hermann Aron, Berlin, Germany. Application filed February 17, 1899.

Clockwork is employed to automatically change the rate during different periods of the day. Wheels are employed having a sliding motion on their axis, each wheel having in its nave a notch with an inclined face, a catch corresponding to the notch and a pointer to adjust the catch to a predetermined time, a spring to force the wheel nave toward the catch, a lever actuated by the wheel nave and mechanism to transmit the sliding motion of the wheels for the purpose of changing the rate of recording the current.

623,104. Electrode for Electric Accumulators. Henri Pieper, Fils, Liege, Belgium. Application filed December 28, 1897.

In an electrode for use in electric accumulators the combination of radially corrugated plates having the shape of hollow truncated cones open at the bottom and top, with plain plates of like description, the corrugated plates alternating with the plain plates and forming inclined open channels on both sides of the latter, and all of the plates being electrically connected to each other.



NO. 623,033.

623,117. Listening Key or Circuit-changer for Operators' Keyboards. Joseph Baxter, Fort Wayne, Ind. Application filed April 25, 1898.

In a ringing and listening key for operators' key boards a movable member is carried by a slide and provided with electrical conductors and electrical contact points are located in the line of movement of the member and connected with electrical conductors, the parts being so relatively arranged that in the movement of the slide one circuit is made and in the movement of the member carried by it another circuit is made.

623,118. Switching Apparatus. Jacob Cloos, Milwaukee, Wis. Application filed February 7, 1898.

The combination with a pivotally mounted switch lever of plugs flexibly connected with the lever upon one side of the pivot, and other plugs flexibly connected with the lever upon the other side of its pivot, contact thimbles normally connected with the feeders, electrically connected thimbles aligned respectively, the first with thimbles and others forming terminals of a loop or distribution circuit, the plugs upon the switch lever being adapted to connect aligned thimbles.

623,119. Switching Apparatus. Jacob Cloos, Milwaukee, Wis. Application filed February 7, 1898.

In a switch for controlling the series distribution of electricity the combination with feeder terminal sockets of loop-circuit terminal sockets, socketed contact portions and plugs adapted for insertion within the aligned sockets, the plates being each adapted through the medium of the connecting plugs to connect one feeder terminal with one loop-circuit terminal to include the loop circuit in series with the feeders, the portion being adapted for connection with the plates, and thereby with all of the feeder and loop-circuit terminals through the medium of plugs.

623,120. Switching Apparatus and Method of Counteracting Arcs. Jacob Cloos, Milwaukee, Wis. Application filed February 7, 1898.

In a device for extinguishing or preventing arcs between contact points the combination is claimed with a supply of insulating liquid of means for causing a vacuum or partial vacuum to effect a flow of the fluid between contact points.

Western Electrician.

EVERY SATURDAY.

Vol. XXIV.

CHICAGO, APRIL 29, 1899.

No. 17

Marconi System in Chicago.

The first public exhibition in Chicago of the Marconi system of signaling through space was given on Saturday, April 22d, by Professor Jerome J. Green of the University of Notre Dame. Professor Green's successful experiments at the Indiana institution had attracted a good deal of attention, and he was invited by the Chicago Tribune to come to this city and make a series of tests under widely varying conditions.

There was an impression in the public mind that the steel structures, the electrical circuits for lighting, street-railway, power, telephone and telegraph service, and the electrical apparatus of every description

building as the receiving end, a distance of three-fourths of a mile and in the heart of the business district. Probably no other part of the city contains as many large steel structures as that through which it was determined to make the initial experiment, and the fact that the first attempt failed was accepted by many skeptics as convincing proof in support of their theory regarding the impracticability of operation in large cities. The real cause of the failure of the first attempt remains a matter of conjecture, and is explained by the several witnesses in different ways. These features may be discussed later, and no doubt an attempt will be made to solve the problem or at least to establish com-

insulated wire to a ball on a flagstaff extending from the top of the Tribune building.

After repeated attempts had been made to establish communication between the Dearborn station and Tribune building the equipment was removed from the railroad office and tested in the Tribune building, where it was afterward set up. The receiving and sending apparatus were placed more than 100 feet apart, with several doors and a steel stairway intervening. No difficulty was experienced in this test, although the spheres were not used and only a couple of yards of insulated conductor was employed for vertical wires.

The next attempt was between the Tribune build-



MARCONI SYSTEM IN CHICAGO.—PROFESSOR GREEN RECEIVING SIGNALS AT TRIBUNE BUILDING.

that is to be found everywhere in large cities might interfere with the operation of the apparatus, if, indeed, it would not be absolutely impossible to establish communication where these conditions prevailed. The fact that Marconi's principal experiments and demonstrations were made on or near the sea or other body of water, and away from the "disturbing influences" of large cities, may have encouraged this view; at any rate, it was quite generally entertained, although electricians who have carefully studied the problem do not share in this opinion. Nothing but actual demonstration, however, could dispel the illusion of the public on this point, and it was partly for this reason that the exhibition of last week was arranged.

Professor Green arrived in Chicago on Saturday morning, and as the first test had been announced for noon, the preparations were hurriedly made. It was decided to make the first attempt between the Dearborn station as the sending point and the Tribune

munication between these points when improved apparatus has been secured.

The sending station in all the experiments was in charge of Professor Green's assistant, Albert Kachur. At the top of the Dearborn tower a spar had been thrust out with a polished zinc ball on one end of it. Attached to this sphere was an insulated wire, the other end of which was connected with the sending equipment. An eight-inch spark-coil was used, and current was secured from storage batteries. A ground was made through the steam piping, and later through the water system.

At the receiving station Professor Green, surrounded by local electricians who had been invited to witness the test, waited patiently for some manifestation of the waves sent out from Dearborn station. The equipment which he employed was constructed at the laboratory in Notre Dame, and was consequently crude. It was made after the pattern frequently described, and was connected by an in-

ing, as the sending station, and the Hartford building, across the street, for the receiving station. This, too, was successful, and the receiving apparatus was then removed to the Marquette building, two blocks away. In all of these tests the arrangements were exceedingly crude, and in the last one in particular little attention was given to details. A staff was extended from a window on the sixteenth floor of the Marquette building, and the vertical wire was suspended between that point and the eighth floor, where the receiving apparatus had been placed. After a few preliminary attempts had been made and the necessary adjustment completed, a sounder was attached to the receiving end and signals were received at regular intervals of five seconds. This completed the day's work in a very satisfactory manner.

Experiments more after the manner of those conducted by Marconi were undertaken on Sunday. The sending apparatus was set up at the life-saving station at the mouth of the Chicago River, and the receiving

equipment placed aboard the tug Protection, which had been secured for the purpose. An eight-inch zinc sphere was rigged up 35 feet above the ground at the life-saving station. The eight-inch spark-coil and the storage battery were placed on the lifeboat chute below and just outside the building. The zinc sphere was attached to a wooden spar and lashed to the lookout on the roof, and from this an insulated wire hung down and was connected with the coil. The receiving apparatus was located at the stern of the tug while it was still moored to the dock at the life-saving station. The zinc receiving sphere on board the tug was hung 27 feet above the deck and about 33 feet from the water. A four-inch wooden scantling was clamped to the after end of the deckhouse and strongly guyed with wire and ropes, and the zinc sphere was fastened at the end of a wooden arm about four feet from the top of the staff. The latter was 26 feet above the deck, and the arm slanted upward sufficiently to raise the ball another foot. From the sphere insulated wire hung to the receiving apparatus.

Albert Kachur, the assistant, was left in charge of the sending instrument at the life-saving station. To facilitate matters a code of whistle signals was agreed on. Three short blasts were to tell the people on shore the message had been received, and one and two short blasts of the whistle were to tell the operator to send a Morse dot and dash respectively. One prolonged blast was agreed on for a signal to stop sending. The lookout man on the life-saving station was to keep track of the signals by a marine glass after the tug got too far out for the sound to be distinguished. In fact, the tug had only gone a little way when it was found to be easier to detect the signals by means of the puffs of steam than to wait for the sound. In this way the Morse signals were received the instant the signals were made.

The first test was made while the Protection lay

although, taking into consideration the difficulties under which he was working, the exhibition must be regarded as highly successful. His idea of the failure of the Dearborn station test does not agree with the views of others. Local influences are the principal causes ascribed by Professor Green, who cites in support of this position the fact that the current from the spark-coil affected the lighting fixtures in the building, and in an office nearby each contact was noted by a flash



JEROME J. GREEN.

extending the entire length of the gas pipe supporting the lighting fixtures in the center of the room. This, however, was explained by Mr. Abbott as a sympathetic spark. He had observed similar demonstrations in his experiments.

It is believed that in the hasty preparation for the opening test the mechanical adjustment of the apparatus was not perfect and the proper spark was not secured. Mr. Abbott is confident that, with more time at his disposal and a better acquaintance with the surroundings, Professor Green will succeed in transmitting signals between Dearborn station and the Tribune building.

An incident of the opening experiment that attracted attention was the reception of signals at the Tribune office when it was known that no electric waves were being sent out from Dearborn station. This was supposed to be due to a spark from a trolley line or an elevated motor probably starting at Van Buren station on the Union Loop. It called attention most emphatically to a defect in the system, as applied to city service. With the multiplicity of trolley and elevated lines to disturb the normal electrical conditions, it was pointed out, the Marconi system, as at present employed, would be useless. This, however, could be remedied by the use of selective apparatus, but here again objection is

a long distance under the conditions which obtained.

Further experiments in long-distance signaling were, therefore, postponed.

The sketches herewith presented were made by Tribune artists.

Marconi's Experiments with French War Vessel.

Signor Marconi, says a cable dispatch dated April 24th, has successfully communicated from South Foreland, Kent, England, to the French armed dispatch vessel Ibis, while sailing in the English Channel. In conducting the experiment he was accompanied by a French naval officer. This feat marks also his first success in concentrating messages at one point to the exclusion of all others.

Copper Trust Said to Be Formed.

[From the Chicago Tribune.]

New York, April 24.—It was reported in Wall street to-day that the huge copper trust had become an accomplished fact.

It was claimed that the Daly-Haggin interest—that is to say, the great Anaconda mine—had entered the trust and that the formation of the combination would be announced next week.

The Standard Oil company's immense wealth is behind this trust. The capitalization probably will be \$500,000,000.

The Rothschilds several years ago purchased the Hearst interest, about one-third, in the Anaconda mine, and it is understood that they have been co-operating with Standard Oil men in securing a controlling interest in this and other valuable copper properties, with the object of combining them into a vast corporation, which shall dominate the copper market of the United States.

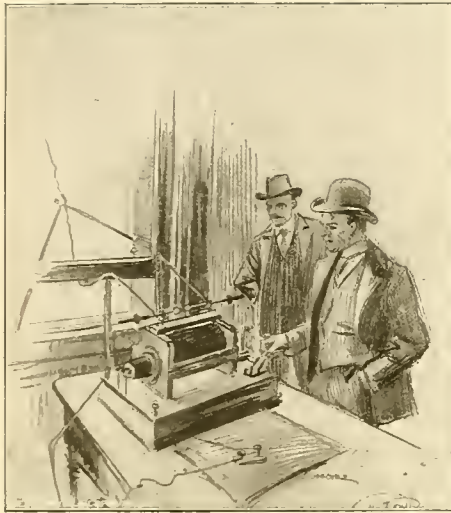
Butte and Boston, Boston and Montana, and other mines which are expected to figure in the consolidation made substantial advances yesterday in the Boston market.

Anaconda stock has recently shown marked activity on the local Stock Exchange, and to-day made the largest net gain of all issues on the list, touching 61% and closing at 60 1/4, a net advance for the day of 6 3/4.

The men active in the negotiations for bringing together all these copper companies are unwilling at present to discuss the prospect of the formation of the rumored company, but it is everywhere believed and nowhere denied that the details of the consolidation will soon be made public.

British Transpacific Cable.

A correspondent of the Chicago Record in Montreal gives details of the construction of the proposed all-British cable across the Pacific with great confidence. He telegraphed as follows on April 21st: "The British Pacific cable to the Antipodes, which is likely to be laid soon, will run from Victoria or Vancouver, B. C., to Fanning Island, thence to the Fiji Islands, and then to Norfolk Island, where the cable will branch, one line being laid to Auckland, New Zealand, and the other to Sidney, New South Wales. The distance from Vancouver to Sidney is



MARCONI SYSTEM IN CHICAGO.—SENDING SIGNALS FROM MONADNOCK BUILDING.

alongside the dock at the life-saving station. Then the Protection started for the open water of the lake, and the experiment began of seeing just how far out the apparatus would work and the extent of the apparent effect of the electric waves.

The water in the river became rougher as the Protection approached the mouth, and the coherer jolted somewhat on the uneven deck. The telegraph relay probably was influenced by the motion of the boat more than the rest of the apparatus, as the armature jolted visibly when the tug lurched on the rough swells. But the Morse dots and dashes were received on the tug with almost mathematical regularity.

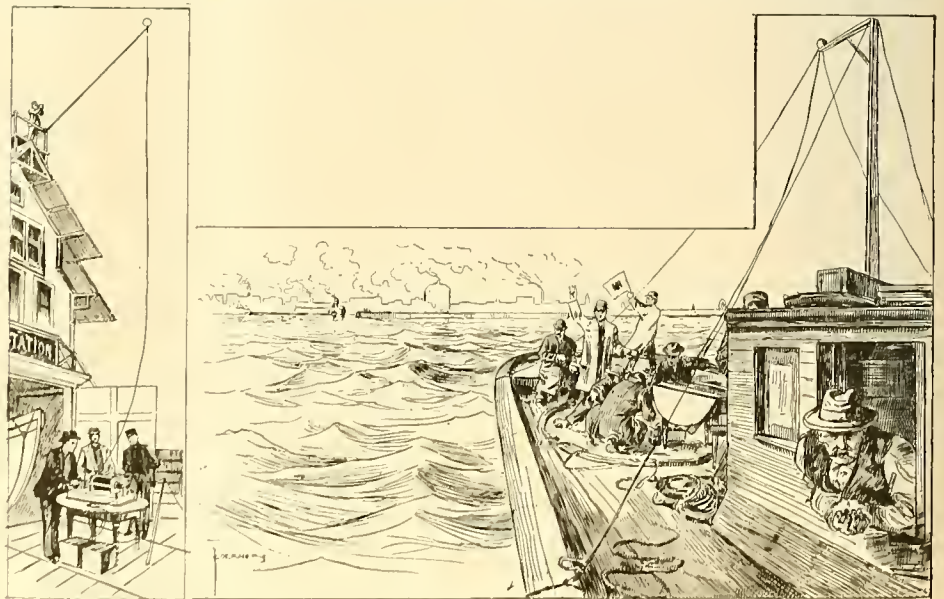
When the tug reached the mouth of the Chicago River and steamed out into the open lake the wind was blowing from the northeast at a rate of about six miles an hour, which freshened later to nearly a 10-mile rate, in the direction best to "kick up" a sea off the Chicago shore. Half a mile out in the lake the boat began to pitch and roll on the swells, and the receiving apparatus was shifted to be parallel with the direction of the boat, which stopped some of the vibration.

The Protection was sent ahead at full speed, and about 1 1/2 miles from shore the boat stopped, but there was no visible difference. When the tug reached a point which Captain Fountain of the life-saving crew declared was two miles from the station the signals suddenly stopped.

The Protection kept on a little way and the apparatus was carefully gone over. No defect could be found in the connections, and it was evident the tug had gone too far from shore for the apparatus to work. There was no way of raising the zinc sphere any higher.

When the boat returned to a point within the range of influence of the electric waves, signals were again received, and before returning to shore the word "Marconi" was spelled out in Morse. This was deemed a fitting ending of the day's experiments.

Professor Green announced that he was not entirely satisfied with the results of these tests,



MARCONI SYSTEM IN CHICAGO.—SIGNALING BETWEEN SHIP AND SHORE; TRANSMITTING APPARATUS AT LIFE-SAVING STATION, RECEIVING EQUIPMENT ON TUG.

raised to introducing more complications into an already complicated system.

The closing test of the series was conducted on Tuesday afternoon, between the Monadnock building and the Tribune office. The apparatus worked perfectly and without the slightest interruption. An earlier attempt to transmit from Dearborn station failed, and Professor Green concluded that the apparatus at his disposal was not suitable for such

6,824 miles. Fanning Island, which will be the first place at which the cable will stop, is about 3,350 miles from Vancouver. This will be the longest stretch of cable ever laid. The line in its entirety will be under British control. The cable will cost about \$7,500,000. Of this Canada will supply about \$2,000,000, the imperial government a similar amount, and the remainder will be contributed by Australian colonies and New Zealand."

Wireless Telegraphy.¹

By RANKIN KENNEDY.

I would venture to make a simple explanation of the action of this transmitting of force from one vertical wire to another at a distance, believing, as I do, that it can be easily and clearly explained on the ordinary, well-established electrical and magnetic principles so well known to most people interested in electromagnetic work.

It is not necessary to go back to the Hertz theories. These have not yet been established, nor can they be until someone proves that the Hertzian

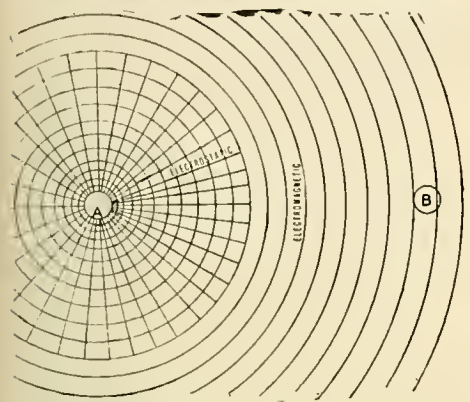


FIG. 1. WIRELESS TELEGRAPHY—PLAN.

waves vibrate at right angles to the line of their propagation, like light waves are supposed to do. Sound waves can be reflected, refracted and detected by means analogous to those used to reflect, refract and detect light or Hertzian waves, and we know that the sound waves don't vibrate in planes at right angles to their propagation lines.

It will be time enough to drag in the Hertzian theories when ordinary accepted theories fail to account for the effects.

There are only two electrical inductive effects known to electricians—electrostatic and electromagnetic—the latter represented by lines of force forming closed circuits. Both of them can act through air, non-conductors and conductors, hence it requires no wire to connect two places, from one of which we desire to act inductively on the other.

Theoretically, we should be able to induce an electric current in an instrument in New York by manipulating another primary current in London or Hongkong, without any wire connection or cable. Practically, there are some slight difficulties, such as the curvature of the earth and the length of the vertical wires requisite, and if we were telegraphing secret messages, they could be read by anyone with a vertical wire and an electric-bell outfit.

Attempts were made first to induce currents at a distance by what may be called the coil or loop method, and this is still under investigation by a very eminent professor, but it is a method doomed to failure at comparatively short distances for two simple reasons.

The science of vertical-wire telegraphy is the same as that of the common transformer or induction coil, and so is the science of the loop or coil telegraphy. In the latter case we set up a primary coil at A, and at B a secondary coil, where we wish to receive messages from A; the space between is the magnetic circuit, a bit longer than usual in transformers and a good deal larger in cross-sectional area than in iron-core transformers; a circuit about as long as Liverpool and as great in area has been used.

The simplest coil is a single turn or loop \mathcal{N} ; if we set up two coils $\mathcal{O}\mathcal{O}$ and generate alternating currents in one, an alternating current will be set up in the other, and if the magnetic circuit is of low resistance and the one loop equal to the

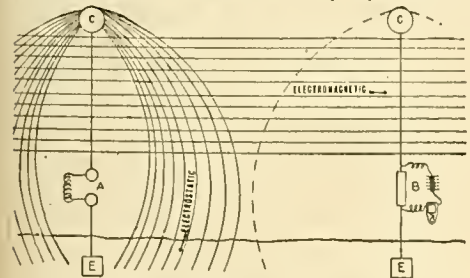


FIG. 2. WIRELESS TELEGRAPHY—ELEVATION.

other, the induced electromotive forces will be equal to the inducing electromotive force in the primary loop, always provided the whole of the induced magnetic flux passes through both loops.

Now the electromotive force generated in a coil of wire through which the induction varies is equal to the product of the number of turns multiplied by the rate of change of magnetic flux density. Expressed by Mr. Weeks as

$$E = 4.45 F r n 10^{-8}$$

F is the total flux, r the number of turns in the coil.

n the frequency of alternations, 10^{-8} to reduce to volts.

Now in a transformer with the primary a few miles from the secondary loop, the amount of the magnetic flux which reaches the secondary cannot be much more than a very small fraction of the whole, and the fraction which does reach it is not all effective, for it cuts both sides of the coil in the same direction, partially neutralizing each other.

4.45 is constant in value, F is naturally exceedingly small, r, for reason to be seen presently, cannot be more than one turn, or, better still, as Marconi has it, should be half a turn; the only factor left us to increase, to keep up the induction at a great distance, is n, the frequency. The higher the frequency, the greater the distance we can operate.

Now high frequency cannot be worked through loops and coils, for at quite limited frequency a loop or coil opposes enormous resistances against high frequency electromotive force, and the current passing is reduced to almost zero. And as F depends on current value, we soon reach a frequency at which any further increase is counteracted by the decrease in current, even in a single loop, vide Tesla's results.

For these reasons the loop or coil method is limited to low frequency, and consequently short distances.

Naturally one at once says: "But we must have a loop to procure a current; it must go in one end and out the other;" that is so, for continuous currents these must have an outgoing and return a complete circuit.

But alternating currents can be sent up and down a single wire with no metallic return. All we require is a capacity at the top of a vertical wire, and an alternating charging + and -, or + and 0 zero at the lower end; every charge at the lower end rushes up the wire as an electric current and charges the ball, or capacity at the top; when the charge at the lower end is discharged or reversed, a current rushes down from the capacity ball at the top. Here we have an alternating current produced in a single wire, and it is this current which induces, F, magnetic-force waves to act on the distant wire.

The reason why the wire must be long is that length takes the place of r in the formula; that is, instead of terms we would take d, the length in centimeters or feet.

Both electrostatic and electromagnetic induction takes place in setting up currents in a single wire. Fig. 1 is a plan of two wires vertical; Fig. 2 is an elevation of the same.

In Fig. 2 the electrostatic lines are curves proceeding from the capacity, C, to earth; hence the earth connection of the one pole of generator; the electromagnetic force travels in horizontal circles and cuts the distant conductor. In Fig. 1 the electrostatic lines are radial; they don't act inductively on the distant wire, but only act in producing the primary alternating current, a local effect concerned only in the alternating-current production in a single wire.

With high frequency the inductive effects near a single wire are startling and interesting.

The spark discharge has been looked upon as an essential in single vertical-wire telegraphy, but it is not so; it is used simply because it is at present the simplest and most effective method of producing very high-frequency charges and discharges; the induction magnetic flux from the spark itself is in the form of a thin disk, the axis of which is the spark; the spark acts for the instant of its duration as a current.

Other methods of producing high-frequency currents in a single wire will occur to many electricians. The sending and receiving wires are simply the primary and secondary of a transformer. The currents produced in the secondary are too minute and of too high a frequency to be received in any magnetic or electric instruments; but, luckily for vertical-wire telegraphy, Branly invented his coherer. This simple apparatus makes an excellent relay, and has been adopted in all the long-distance work—an impossibility without it.

There is no mystery about the long wire vertical; the mystery is, Why should anyone use a loop and low frequency?

The new Wehnelt interrupter and improved spark-producing apparatus may make great advances in the near future.

It seems to the writer very strange that nothing better than the rude, inefficient induction coil of 50 years ago should be the thing used for the high-frequency, current-generating apparatus.

They may be very simple, but they are costly and not durable machines in every-day, constant use.

If the wire is horizontal, there is little or no effect, probably because of the inductive effects of the earth, through which one-half of the magnetic flux would pass, the electrostatic induction would also be disturbed by the proximity of the earth to a horizontal wire.

The question is, What is the limit to be placed on the frequency of the current in the vertical wire, and what is its impedance to high frequencies?

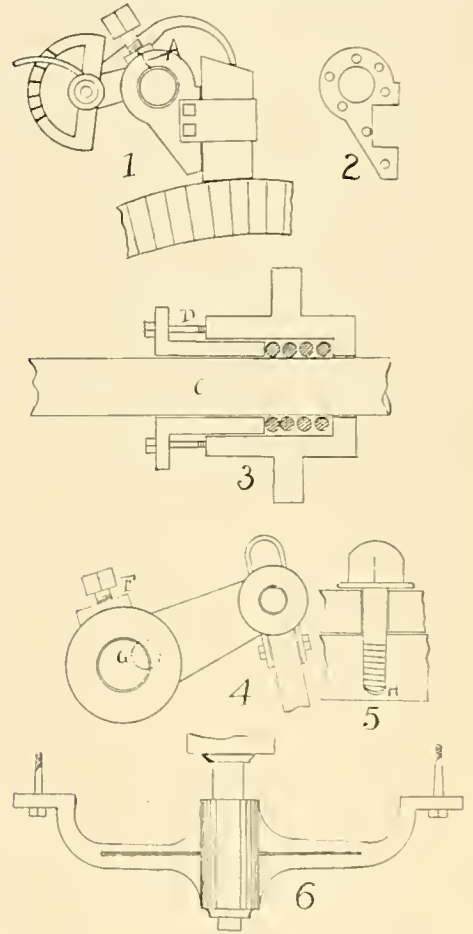
No part of a single wire can be cut by its own magnetic flux. With a loop the flux from one side cuts across the wire on the other side, causing much impedance with high frequency.

F. McCormack will construct the electric-light plant at Pine City, Minn., as early as possible.

Operation of Electric Pumps.

A contributor sends to the Western Electrician some mechanical hints for the effective operation and quick repair, when necessary, of electric pumps and machinery of like character. He notes that, as in all other machines, the only way to get effective work from electrically driven pumps and other electrically driven apparatus is to properly connect the motors and to properly maintain the machines in working order. In one place where a slow-speed multipolar motor was directly connected to a pump plunger shaft, very poor work resulted as a result of defective adjustments. An examination showed that the brush-holder was broken at A (Fig. 1), due to the use of a set-screw of too large diameter. The tension on the brushes could not be adjusted correctly. The workmen condemned the whole outfit. But the cracked piece was finally repaired by cutting out two thin pieces like that in Fig. 2, and riveting them on each side. Thus supported, the tension could be properly controlled, and the pump was driven satisfactorily thereafter.

The direct-acting pump is of simple design, and for that reason is widely used for ordinary lifting or moving of liquids. Simple as its construction is, the writer has known of many cases in which the pumps have been rendered unserviceable through defective packing. Frequently the defect is attributed to the driving power of the pump. An electric motor or belt power from other sources cannot drive



OPERATION OF ELECTRIC PUMPS.

a pump when the flange D (Fig. 3) is forced so tight on the packing that the packing is caused to bind on the piston C. Yet men have been seen trying to overcome a leak at this point by screwing up the bolts to a snapping point. Worn-out piston rings, leaky valves, defective stuffing boxes, gummed parts, dry bearings, pump out of line and other defects should be looked for when a pump simply churns water, instead of blaming the electric motor or other source of power.

Usually the motor is geared to the plunger shaft of the pump, but in one case the machinist made the connection by means of a crank, as in Fig. 4, and this crank was held to the shaft by the set-screw F. This screw soon had a groove cut around the diameter of the shaft, and the lack of firmness of this weak connection caused the pump to lose power. Of course the fault was thought to be with the motor, until someone suggested that the crank be keyed to the shaft, as represented at G, showing a round key sunk into shaft and shoulder, resulting in a secure connection, after which that pump and its motor worked to full satisfaction.

In connecting a motor to a pump it is essential that the parts be very firmly secured, so that vibration may be avoided. Instances in which the set-screws for forming the connection are too long are not infrequent. Fig. 5 gives an example. The mechanic puts the set-screw into its place, but the tip engages with the seat of the hole at H before the shoulder of the head of the screw presses on the

1. From the London Electrical Review.

part it is intended to hold. This is a simple imperfection, and may be avoided by sinking the hole a little deeper, or by using shorter screws; yet this type of defective work is frequently found to exist in machines which are claimed to rattle and otherwise exhibit signs of looseness at some point.

Fig. 6 is a design for the end of the shaft bearing of a motor which is patterned to be attached to the framework of any apparatus for supporting the shaft. It is made from wrought-iron and provided with holes in the flat ends to receive the one or more set-screws for attaching the piece to the frame.

Storage Battery Regulation.

Many unusual conditions in modern practice have been satisfactorily overcome by the use of the storage battery. An example of this kind is furnished by the experience of the New York, New Haven and Hartford Railroad company in lighting the Hartford station. It will be remembered that the company operates a large section of its suburban service electrically, employing a third-rail system at 500 volts, subject to all the fluctuations of voltage incident to such a system on account of the current required for starting and accelerating the trains.

The fluctuations in the voltage on the railroad circuit are extremely violent at the Hartford station, which is located at the end of the third-rail system, there being no feeders and the current being supplied from the third rail only. Lamps could not be operated from an ordinary motor-driven generator, and a combination of the motor-driven generator and regulating battery was finally decided upon.

The generating unit consists of a 45-kilowatt shunt-wound generator direct-connected on a common bed-plate to a specially compound-wound 500-volt motor, the compounding being so designed as

Opportunities for the Establishment of Electrical Supply Houses in North Brazil.

By C. PAULO REI.

The valley of the Amazon, that vast region bordering the 4,400-mile course of the Amazon River and comprising the larger portion of the states of Para and Amazonas, may truthfully be said to possess a charm for the engineering world, containing, as it does, so many almost insurmountable difficulties in preparing it for the abode of man.

The development of the greater portion of this region will constitute a problem for future generations, and for the present the cities of Para and Manaus and the small towns on the Amazon between them will demand chief attention.

The city of Para (official name Belem), situated only about 100 miles from the mouth of the Amazon River, is in reality on the east bank of the river Para, which forms one of the many channels by which the waters of the Amazon and of the Tocantins find their way into the ocean. It is the key to an enormous stretch of wealthy country, and indications are that it will become the Chicago of South America. The river is 20 miles wide opposite Para and 40 miles wide at its mouth, and although the internal communication afforded by the Amazon and its branches is extensive (no less than 150 steamers being employed), railroads and other means of transportation on land will soon be needed in order to assist in handling the ever-increasing commerce of Para and Manaus.

Although situated only about one degree south of the equator, the climate of Para is by no means so hot nor so unhealthy as might be supposed. But the air is exceedingly moist. The rainy season extends over two-thirds of the year. Generally the

daily newspapers, eight banks and a fine library and museum.

The principal electric-lighting company is the Companhia Luz Electrica Urbana, of which Signor Lucio Freitas do Amaral is the general manager. Three triple-expansion engines of 400 horse power each and one vertical compound condensing engine of 600 horse power are used. The electrical machinery was purchased in Germany, and is operated by Brazilian and Portuguese workmen. Although the company seems to favor Germany in purchasing supplies, it might be well for American manufacturers to correspond with the general manager, either in French or Portuguese.

Another prominent lighting company is the Companhia Luz Electrica Paraense, of which Signor Joao Alves de Freitas is the proprietor and manager. One 400 horse power engine and one of 200 horse power, both compound condensing, and of American manufacture, are used and are giving satisfaction. In fact, this is essentially an American plant, although some few purchases are made in Europe. Most of the plant was purchased from the Western Electric company of Chicago, and orders for supplies are sent direct by Signor Freitas, who is both prosperous and reliable. A really good opportunity now exists for the establishment of a large supply store for the sale of electrical machinery and apparatus, and were this establishment placed in the hands of competent electrical experts success would be doubly assured.

It is well known that the municipality is anxious to sell the waterworks of the city, with a view to its being taken up by a company and considerably extended. It is also known that the authorities are desirous of having a complete system of drainage for flood water and sewerage. This should be a good opportunity for a contractor, and it is clear that there would soon be a large demand for sanitary appliances. There are other opportunities offered live young Americans with a small amount of capital, such as the establishment of cold-storage and ice plants. At present beef must be eaten immediately after killing, as no such plants exist. For steam laundries and brick plants, equipped with up-to-date machinery and managed by persevering and active Americans, there are also good openings. Owing to the fact that money appears to be made so much easier in rubber, it is difficult to induce the Brazilians to enter any other business, and for this reason mainly so many opportunities exist in a city of over 100,000 population.

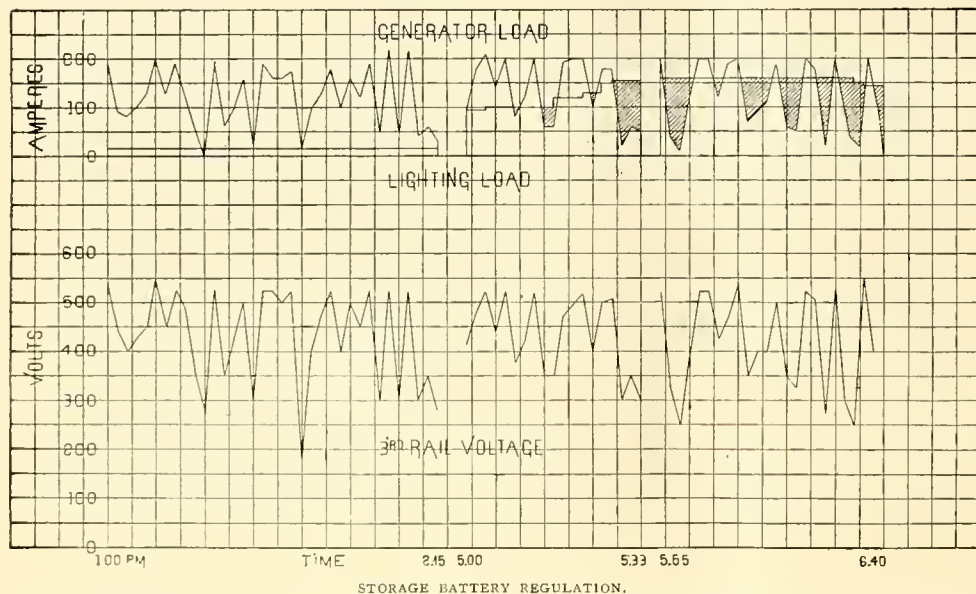
From Para runs the only railway yet constructed in this part of Brazil, known as the Braganca railway, the concession for which was granted in 1879. It is a single line of one meter gauge, with American rolling stock, and was intended to reach Braganca, a distance of 209 kilometers, but only about 60 kilometers has been constructed and opened for traffic. It is the property of the government, and, as usual with government lines in Brazil, the traffic does not pay working expenses. The freight consists mainly of building stone, sand, lumber and firewood. Braganca is east of Para, on the seacoast, but has no harbor. The district abounds in agricultural products, and the line may be made to pay when it is completed. It is also intended to prolong the line to Maranhao, so as to form part of a continuous line along the seacoast to Rio de Janeiro.

At Manaus there are similar opportunities for energetic and brainy young Americans as at Para, although, as the population is considerably smaller (the city now containing about 25,000), the demands are more limited. For an electrical supply house the prospects are nearly as good here as at Para, as the city has electric light and a system of electric tramways. It has fine public and private buildings, and the same spirit of development and enterprise is to be met with here as in Para. The population is rapidly growing and is becoming quite cosmopolitan, and even now quite a number of Americans (a large number of whom are dentists and clerks in rubber houses) are to be met with in the streets daily.

Municipal Street Railways.

[Special correspondence of the Western Electrician.]

Detroit, April 24.—Prof. E. W. Bemis of the College of Agriculture, Kansas, arrived at Detroit last Saturday, to begin the work of computing the value of the Detroit Street Railway company's 179 miles of electric-road franchises. The professor declares that he can make the estimate in about five days, working day and night. Concerning the general question of the municipal ownership of electric railways, now agitated in Detroit, Mr. Bemis expressed himself as follows: "There are but two views," he said. "I refer to the ownership of street railways, gas plants, telephone systems and water works. One is the private ownership and operation, the other public ownership and regulation. While the latter is better than nothing, it has proven in the past little better than a failure. In the majority of cases the municipal commissioners, receiving comparatively small salaries, soon find the millionaire corporation liberal, and the regulator becomes the regulated. The Interstate Commerce Commission is a fair sample of this sort of failure. The aggregate influence of the tremendous monopolies has governed many a commission, and the regulation by the public has therefore become of little use."



to run the motor as nearly as possible at a constant speed through large variations of voltage in the motor circuit, which is derived from the third-rail system of the railroad.

The plan of operation and the results obtained are well exemplified in the curves shown in the accompanying illustration. The lower curve gives an excellent idea of the extreme variations in the motor circuit. It will be noticed that this covers a range of 375 volts, or from a minimum of 175 volts to a maximum of 550 volts. The battery is directly across the system as a regulator, receiving its charge through the hours of light load, as will be seen by reference to the left-hand set of curves, and is required to furnish a small amount of current only when the generator current drops off, due to fall in the voltage on the motor, to a point below the lighting load shown by the straight line across the curve. As the lighting load increases, it will be noticed from the right-hand set of curves, there is a large portion of the time when the generator is unable to furnish the current required for the lighting load, which is in turn supplied by the battery, which thus keeps a practically constant pressure on the lamp circuits, discharging whenever the generator current falls below the load and charging when the reverse occurs. In addition to this service, when the lighting load falls off to a minimum the generator is shut down and the battery furnishes all the current required, constant potential being maintained by the ordinary method of cutting in reserve cells.

The installation was supplied by the Electric Storage Battery company of Philadelphia.

In the reports of the recent tests of the Austrian War Office in the use of liquid air as an explosive, it is stated that the experiments foreshadow a complete revolution in the application of explosives. The experiments made in Austria were conducted in a quarry by a technical committee from the War Office, and the results were said to be remarkable.

temperature is delightful in the early morning, and about midday thunderstorms occur, which flood the streets and cool the atmosphere. In the evenings heavy dews fall.

As Para has for many years been the principal emporium for the Amazon trade, both for the exports of produce and for the supply of the interior towns and cities with foreign goods, it has naturally had an extensive commerce. Of late years this commerce has been greatly increased, owing to the increased trade in rubber, and as a result the city has flourished exceedingly. No other city in South America, with the exception of Buenos Ayres, has made such rapid progress. In 1872 the population of the city was about 35,000; in 1888 it was 60,000, and at present it is over 100,000. Few people have any idea of the wealth, advancement, luxury and activity which are to be seen in this remote equatorial city. Both lines of steamships running between Para and New York are increasing the number of their ships, as they are entirely unable to carry the heavy freight billed to and from Para. In August, 1898, the two lines made one trip each a month, which they later increased to two, then three, and now weekly trips are being made. No better evidence could be brought to show the greatly increased commerce, as the ships are not only heavily loaded with rubber, etc., from Para, but they also bring return cargoes of all kinds of American manufactured goods from New York. As the freight rates from New York are much cheaper than from Europe, this demand for American goods is likely to grow to large proportions, as both the mercantile community and the government are rich and daily growing richer. Money has in reality literally poured into the place, and both public and private funds are being lavishly spent upon works for improving and beautifying the city. It has now magnificent public buildings; the theater is said to be the finest in South America, and the Bourse is also a splendid edifice. Street-railway lines run in all directions, and the telephone and electric lights are everywhere used. Para has five

A Great Carbide Factory.

By ORRIN E. DUNLAP.

The new plant which the Union Carbide company is building on the property of the Niagara Falls Power company is rapidly assuming its proportions, and already it is seen that it will be one of the largest manufacturing plants at Niagara Falls. The site selected for the works covers several acres west of the Niagara Junction railway and north of the tracks of both the New York Central and Erie railroads, but the terminal facilities will be furnished by the Niagara Junction railway. In all three buildings will be erected, two for factory purposes and one to be used as an office. The factory buildings are very large and extend back 864 feet. They stand about 80 feet apart and are principally of iron and brick. The roof is now being put on the first building, while the second building is rapidly assuming size.

The front section of the first building is three stories high, or 53 feet to the eaves. Here will be located the pulverizing department, the dimensions being 132 by 75 feet. Next will come a two-story section, 30 feet to the eaves, in which there will be one large room 30 by 75 feet, and this probably will be used as a dust-collecting department. Next to this, in the rear, will be the furnace room, which will be 395 feet long and 75 feet wide. In the rear of this still will be the packing and shipping department, 300 feet long by 75 feet wide. Up through the center of this room railroad tracks will be run alongside of platforms to facilitate shipment of the

current for the Carbide company's use. These transformers will be similar in pattern to those installed by the Westinghouse company for the Cataract Power and Conduit company in the Ohio street station in Buffalo.

The contracts call for the operation of the plant by July 1st. The Niagara Falls Power company is now building a cable conduit from the power house to the carbide works. This conduit will consist of 36 vitrified-tile ducts, each 3 1/4 inches interior diameter, laid in a nest and sheeted with cement. The total length of conduit will be 12,000 feet. Thomas Dark & Son of Buffalo are doing the work. Beneath the cable tile in the trench a sewer pipe is laid, in order to afford good drainage. The structural iron for the factory buildings is furnished by the Berlin Iron Bridge company, and the Penn Bridge company will furnish the storage bins. The elevator and conveying apparatus will be supplied by the Jeffrey Manufacturing company. The contractors on the building are Wentworth & Taylor, who have had many important contracts in factory construction at Niagara Falls. They have a very large force of men at work, and rapid progress is being made in the erection of the buildings.

The superintendent of the Union Carbide company at Niagara Falls is Mr. E. F. Price. He has been connected with the industry ever since its beginning, and thus he has had great experience in the manufacture of carbide. It is under his careful supervision and that of Mr. I. R. Edmonds, the company's electrician, that the new plant is being built. The general manager of the Union Carbide com-

West Australia's Electrical Activity.

[Prepared for the Western Electrician by the Philadelphia Commercial Museum.]

Perth, the capital of West Australia, and Fremantle, the chief port of the colony, have recently adopted electricity; the former for lighting and as the motive power for its newly introduced system of surface cars and the latter for public lighting. Construction of the Perth electric-railway system was begun in February, but the introduction of the electric light at Fremantle has only just been agreed to by the Municipal Council and bids for the installation called for.

By direction of the Fremantle Council the "plans and any other available information have been ordered to be forwarded to the leading manufacturing firms in England, with a view to obtaining estimates of the cost of the plant installed." This action was taken in the middle of January, and, presumably, the English manufacturers are by this time sending in their bids. American manufacturers were not barred from making bids, but it is only natural that an English colony should draw its supplies from the mother country. At the same time, it may not be too late for Americans to interest themselves in the matter, either directly or through their English or colonial representatives.

The scheme for lighting adopted by the Fremantle Municipal Council is the continuous-current system, with a potential of 400 volts, on the three-wire system. The wires are to be carried on poles. G. A. Wright, the engineer who prepared the report on which the council acted, says: "There is at the present time a great demand for electric light in the town, and I am certain that the committee can look for a large private consumption of current from the start." He estimates the cost of installation as follows: Power station, buildings, foundations for plant, chimney, etc., \$10,000; boilers, condensers, engines and dynamos, \$35,000; storage batteries, \$7,500; switchboard, \$2,500; cables, wires, arc and incandescent lamps, poles for street lighting (erected), \$30,000; total, \$85,000. It will be interesting to add his estimate of the cost of operating the plant for a year, which is: Coal, \$7,000; oil, waste and engine-room stores, \$750; repairs and maintenance of plant, \$1,000; salaries, \$7,550; allowance for depreciation for first year, at 2 1/2 per cent., \$2,125, making a total of \$18,425.

The Municipal Council discussed a combined scheme of electric lighting and street cars, which was not adopted. The railway scheme will undoubtedly be taken up later. Fremantle is a growing city and has boomed since 1897. At the end of 1898 there were, approximately, 2,120 permanent buildings in the municipality of Fremantle, 520 in East Fremantle and 473 in North Fremantle, a total for Fremantle and its suburbs of 3,113. The buildings are of a permanent character, and two-thirds of them are constructed of brick or stone.

The Perth City Council has called for bids on or before May 1st for lighting the streets and municipal buildings with electricity. Bidders must quote, first, a lump sum per annum to be paid by the council for lighting streets and municipal buildings during the first five years, and lump sums for the same service during three following periods of five years each. At the completion of the 20 years the concessionaire must be prepared to hand over to the council, free of all cost and in good working order, the whole of the plant, conduits, cables, etc., used for streets and municipal-buildings lighting, to be entirely separate from the commercial lighting which may be carried on. The successful bidder will be granted a concession to supply commercial electric lighting within the city, the concession to last for 20 years, after which he must hand over to the council, free of cost and in good working order, the whole of the plant, conduits, cables, etc., used for the commercial lighting, the plant to be entirely separate from the other. The street and municipal-buildings lighting system must provide for the lighting of all streets, lanes, parks and municipal buildings within the city boundaries, and the plant must include 250 arc lamps, each of not less than 1,200 candle power, 200 incandescent lamps, each of 50 candle power, 150 of 32 candle power and 250 of 16 candle power. All cables are to be placed underground, and must be conveyed through the streets in jarrah troughs or boxes or other suitable form of conduits, to be approved by the city engineer.

The Perth street-railroad scheme calls for the construction of 13 1/4 miles of line within two years, and the total length of 17 miles within five years. The initial work of construction was begun on the first of February. It is worthy of note that the Railway Department of the colony refused to allow any of the lines to cross the railroad system at grade.

Havana Street Railway.

According to a dispatch from Havana, a court in that city has just rejected an appeal from the decision of a lower tribunal that the sale of the Ferro-carriil Urbano (City Railway) by a minority of its stockholders to the syndicate headed by Colonel George B. M. Harvey of New York was null and void, having been fraudulently obtained. The sale was effected on December 27th, the value of the stock being placed at 92, and the total sum paid being \$1,472,000. It was declared at the time by members of a competing syndicate, made up of Canadian capitalists, that they would have paid 125 for the stock, and they will probably bid for the property if the recent sale shall be annulled.



A GREAT CARBIDE FACTORY.—VIEW OF THE NEW PLANT OF THE UNION CARBIDE COMPANY AT NIAGARA FALLS.

product, while an upper floor will be used for storage purposes. It is not the thought of the company, however, that much storage room will be needed, considering the great and growing demand there is for carbide. In and about the plant there will be about 3 1/2 miles of railroad track, and the company will have a locomotive of its own to do its switching, so that there will be no delay in handling cars. When in full operation the output capacity of the plant will be over 100 tons of carbide a day, and it is the company's expectation that in raw material and product it will handle from 30 to 40 cars every day.

The second building, with the exception of the three-story front section, will be a duplicate of the first, and the two buildings will have over 100 furnaces, which are now being made by the Dobbie Foundry and Machine company of Niagara Falls. In the course of time it is expected that the company will use 25,000 electrical horse power in these two buildings. The furnace rooms in each building have six distributing points for current, three on each side.

Mention has been made in the Western Electrician of a portion of the transformer equipment to be installed in this plant. The Wagner Electric Manufacturing company of St. Louis will furnish seven static transformers of 2,000 horse power capacity each and two static transformers of 500 horse power capacity each, all complete with switchboards for operating them. These transformers will be of the oil-insulated type, with water coils for lowering the temperature of the oil. The Westinghouse Electric and Manufacturing company of Pittsburg will furnish nearly 10,000 horse power output capacity in transformers to the Union Carbide company, while it will also supply the Niagara Falls Power company seven 2,500 horse power transformers, to be used in stepping-up the two-phase, 2,200-volt current from the generator to three-phase, 4,400-volt

product is Mr. W. P. Martin, at the main office in Chicago.

Street-railway Ownership in Detroit.

A committee of 62 citizens of Detroit has filed a bill of complaint in the Circuit Court asking that Governor Pingree and the other members of the Detroit Street Railway Commission, and the city of Detroit, be temporarily and perpetually enjoined from taking any further steps toward purchase and operation of Detroit's street railways under the McLeod act, authorizing the same, and asking that the McLeod act and all proceedings thereunder be decreed to be void.

The discovery of an alleged flaw in the McLeod act authorizing acquisition by the city of Detroit of the street railways has raised another point against the project. The engrossed bill does not contain a clause which was in the original, providing that nothing in the act shall affect the granting of franchises by the City Council. Governor Pingree says the omission of the clause is of no consequence, but the attorneys of the Citizens' company assert that the alleged discrepancy is a strong point in the proceedings they are about to bring to test the act.

Paris Exposition.

The United States Commission to the Paris Exposition of 1900 states that all who desire to exhibit in the exposition are requested to immediately notify the commissioners, if they have not already done so, in order that they may be considered in the allotment of space which will soon be made. While there are many applications on file in every line of industry, it is desirable that the American sections be not only representative of this country, but also represent the largest possible number of producers. The Chicago office is in the Auditorium; the New York office is in the Equitable building.



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Frequently of late attention has been called to the fact that many English municipalities are engaged in the work of transforming their old horse-car systems into modern electric systems. As a natural consequence there has arisen a great demand for "trolley poles," the iron posts to which are attached the overhead wires. This demand has increased the activity among transportation lines, and freight steamers arriving at Liverpool from the ports of New York and Boston have been carrying large consignments of these poles. It is a noteworthy fact that one such shipment was consigned to Birmingham, the seat of England's iron industry.

An obstacle in the way of American inventors and manufacturers, who desired to introduce their products of the newly acquired possessions of the

United States was found in the statement that the patent regulations did not apply to these islands. To eliminate these difficulties the War Department, acting upon suggestions made by the secretary of the interior and the commissioner of patents, has determined to extend the patent laws of the United States, so far as they relate to the protection accorded owners of patents, etc., to all the islands which are now under military government by the United States. This action is tentative, and is regarded as a measure of martial law that will be superseded by provisions of a more comprehensive scope when the Patent Commission, now engaged in an examination of the United States patent laws with a view to their amendment and codification, makes its final report.

An interesting process is presented in the modifications recently introduced in the electrolytic manufacture of permanganate. The original cells required frequent recharging; they did not lend themselves to a continuous process and did not directly yield solid salt. The cells now used form troughs with funnel-shaped bottoms. In these the trough serves as an anode, while the cathode cells, which are suspended in the upper part of the trough, are narrow boxes with porous walls acting as diaphragms. The additional anode plates are near the porous walls, but are themselves separated from one another by boxes with perforated bottoms. The anode trough is charged with the mother liquor of the last permanganate crystals; the cathode cells are filled with water and the intermediate boxes are charged with crystals of manganate of potassium. This salt passes into solution, as its solution is converted into permanganate. It has been observed that the caustic-potash solution which collects in the cathode cells may also be left in the anode compartment to a strength of 40 per cent., without disturbing the reaction, and, in fact, with a beneficial effect, as it hastens the crystallization of the permanganate. Thus, the electrolysis proceeds until the funnel is full of permanganate crystals, or until the caustic becomes too concentrated. Crystals and liquor may continuously be withdrawn, and fresh mother liquor used for refilling, if preferred, however.

Chicago has had an opportunity to witness a practical test of the Marconi system of signaling through space without connecting wires between stations, both "on land and at sea," and the results were highly satisfactory and successful. The test made in this city on Saturday was one of the most difficult that could have been devised, not only on account of the disturbing elements of a large city, but also because the apparatus employed was crude and the experimenter was hardly familiar with it; moreover, the time allowed for making the preparations for the test was exceedingly limited. Under the circumstances, absolute failure would not have been surprising and partial success would have been gratifying, but no one anticipated that the initial exhibition would prove as satisfactory as it really did.

Professor Green certainly achieved notable distinction in securing such results in the face of adverse conditions. He succeeded in sending signals 650 feet between the Tribune office and the Marquette building, which is regarded as conclusive evidence that steel structures and electrical conductors do not interfere with transmission by electric waves. On Sunday even better results were obtained between the life-saving station at the mouth of the Chicago River and a tug-boat sent out on the lake for the purpose of determining the range of influence of the electric waves. It was claimed that signals were received at a distance of two miles from shore, and within that limit no trouble was experienced in communicating by this method, although the lake was rough and a high wind was blowing. This would seem to support Marconi's belief that the maximum results will be obtained over water.

With improved apparatus and experience in operation better results will doubtless be secured. The instruments used in the Chicago experiments were hastily constructed in a college laboratory, and were not intended for such service as that to which they were applied. In view of these facts and other adverse conditions, it is surprising that such

an excellent record was made. Lieutenant Della Riccia, in Brussels, after much experimenting and with improved instruments, succeeded "in one case," to which Marconi makes special reference, in sending signals "400 yards through nine houses and a hotel constructed largely of iron." This was considered a noteworthy achievement, and was cited by Marconi as a remarkable performance in the discussion before the Institution of Electrical Engineers in London last month. In view of these facts Professor Green should feel encouraged by the success he has attained, and American experimenters should attack the problem in their usual energetic manner. The tests in this city have doubtless started a series of systematic experiments by American investigators, and these examinations and studies should be fruitful of results.

The depression noticed in the stocks of the Eastern Telegraph syndicate has given rise to much speculation, and one of the causes to which this decline in values has been attributed is the successful experiments and remarkable advancement that have been made in developing the Marconi system of telegraphing without connecting wires. A much more reasonable explanation would be the fact that the monopoly now enjoyed by the English capitalists would eventually be ended by the building of the Pacific cable. But this should not influence these securities at this time; on the contrary, the failure of Congress to enact legislation looking toward the establishment of telegraphic communication across the Pacific might reasonably be expected to exert a beneficial influence upon the market.

It is probable, however, that in spite of this failure of Congress to act, investors in this class of securities realize that the time is near at hand when this work will be undertaken. The attitude of the present administration is significant. Preparations have been made for completing the survey of the Pacific in anticipation of the action of Congress next winter. The researches of the Thetis and Albatross several years ago, supplementing those of the Tuscarora made long before, assured the practicability of the route from Monterey or Point Conception, south of San Francisco, to Honolulu or Hilo Bay, and the present expedition is intended to examine the route between Hawaii and the Philippines.

The government has selected for this work the Nero, a steel vessel built a few years ago at Sunderland and bought for the auxiliary navy. She has been overhauled at Mare Island lately and refitted for survey work. The stretch between Hawaii and the Philippines is not only far longer than that between California and Hawaii, but has been less studied, while such soundings as have been taken in it indicate some very deep places. This is especially true along the eastern shores of Japan, from the Kurile Islands southward, where a trough has hitherto defied soundings. Admiral Belknap's survey reported that it exceeded five miles and a quarter in depth. It lies under the Kuro Siwo or Black Stream. In other parts of the Pacific, too, sharp changes of level are found, in striking contrast to the bed of the Atlantic. The Japanese current, however, is the chief obstacle, and it may increase by its force the difficulty in laying a cable successfully, apart from the depth of the Kuro Siwo channel under it.

Some difficulty, it is anticipated, will be experienced in securing suitable intermediate stations. Necker Island may be the first stopping point, but Midway Island, which was once favorably considered, is not now looked upon as particularly desirable. The Marshall group is favored, but it belongs to Germany, and it is asserted that the same power is to acquire from Spain the island variously known as Strong's, Kusaie and Ualan, in the Carolines, which has long been looked upon as an ideal landing-place for a cable. Johnston Island looks practicable, but it is a British possession. Marcus Island has been well spoken of, and Guam is to be on the line, but the long stretch between Honolulu and Guam makes it desirable to break up the distance. It will be seen that there are still many problems to be solved before the Pacific cable project is assured, and the government is acting wisely in taking up the subject thus early.

Relative Dynamo and Motor Capacities.

By ALTON D. ADAMS.

It is sometimes of practical importance to determine the capacity of a given dynamo, when used as a motor or vice versa, and it is of general interest to understand the relation which should hold between the dynamo and motor capacities of the same frames. At first glance this problem may seem too simple to be worth solving, but a little consideration will show it worthy of careful analysis, and an examination of manufacturers' catalogues will probably deepen the impression.

A common presumption is that the manufacturer of an electric machine is better able than anyone else to state its capacity for any service, but when each of the catalogues of several manufacturers gives a dynamo of a certain kilowatt capacity a different rating as a motor, it is fair to conclude either that no definite relation exists between dynamo and motor capacity or that the relation between these capacities is not always given the consideration it merits. To illustrate the variation in the relation of dynamo and motor ratings, the kilowatt capacities of generators, each rated at 10 horse power as motors, have been selected from the catalogues of three prominent manufacturers, as follows:

Type A—Motor rating, 10 horse power; dynamo rating, $7\frac{1}{2}$ kilowatts.

Type B—Motor rating, 10 horse power; dynamo rating, eight kilowatts.

Type C—Motor rating, 10 horse power; dynamo rating, 10 kilowatts.

Each of the foregoing machines is rated at from five per cent. to 10 per cent. higher speed as a dynamo than as a motor, but as this speed variation is common to all three machines, it cannot be said to account for the variation of 33 per cent. in their stated kilowatt capacities. If there be any necessary and general relation between dynamo and motor capacities, it is obvious that all of the ratings cannot be correct, and the object here will be to point out, if possible, such a relation. To correctly consider this matter it should be held in mind that the kilowatt capacity of a generator is measured in electric energy delivered to the line, while the horse power of a motor is determined by a brake at the pulley. The kilowatts of a dynamo are the mechanical power spent in driving it minus the internal losses, and the horse power of a motor is the electric energy delivered to it minus the internal losses. The losses in both dynamos and motors are divided into two classes—winding losses, which occur in the armature and magnet coils, and frame losses, which comprise friction, hysteresis and local currents in the iron.

The total frame losses are nearly the same in a motor and dynamo, when each operates at the same speed and with the same amperes in their windings; the heating tendency is therefore the same in each machine, also the sparking. As the rise in temperature and the sparking tendency are the real load limits in both dynamos and motors, it seems reasonable that the rating of a given electric machine, whether as dynamo or motor, should be based on the same armature current and the same or nearly the same magnet-winding current. A little more energy may be allowed for the magnet winding of a dynamo than a motor on the same frame, in some cases, because of the series winding or additional shunt needed by the dynamo. If the winding losses and temperature rise in a given frame are the same whether it is used as a dynamo or a motor, the electrical horse-power output of the dynamo will be greater than the mechanical horse-power output of the motor, because while the frame losses of the dynamo are supplied by the driving power in addition to the electrical output, these same frame losses must be deducted from the electric power supplied to the motor, as must also the winding losses, to find the capacity of the motor for mechanical work.

Another cause which slightly reduces the output of a given frame as a motor below what it would have as a dynamo is found in the fact that, while motors usually have exactly the same armature winding as dynamos of corresponding capacity, they are very seldom supplied with electric energy at the same voltage or pressure as that on which the dynamo capacity of the same frame is based, but at a slightly lower pressure, due to line loss, so that, with a fixed maximum for the armature current, less watts are delivered to the motor than the same machine would deliver if used as a dynamo. The lower volts at motor terminals and the fact that the dynamo armature must generate volts enough to overcome the pressure lost in its own windings in addition to the volts at brushes, while the counter volts generated in the motor armature is the line pressure minus the pressure lost in armature windings, account for the difference in speed between a motor and a dynamo on the same frame. To compare the power of a given machine as a motor with that which it would deliver as a dynamo, it is desirable at first to know the rate at which energy is consumed in the magnet windings. Taking the case of a shunt-wound magnet and assuming the same watts in the winding for both dynamo and motor, it is evident that the dynamo armature must furnish the amperes required in shunt coil plus the amperes at which the dynamo is rated. For the same armature current in the motor as in the dynamo, therefore, the total amperes delivered to the motor will be the rated dynamo amperes plus twice

the amperes taken by the shunt-magnet winding, or, in other words, the watts delivered to the motor should be the rated dynamo capacity of the machine at the same volts plus twice the per cent. of watts consumed in the magnet coil. It is now evident that with motor and dynamo ratings, each based on the same winding losses, and, consequently, very nearly the same temperature rise, the motor capacity of any machine may be found from its dynamo rating by adding to this rating twice the watts in shunt winding and then multiplying this sum by the efficiency of dynamo, provided the motor and dynamo ratings are based on the same volts at brushes. If, as is frequently the case, the volts at the motor are less than the volts on which the dynamo rating is based, then motor capacity as found heretofore should be reduced by the per cent. in which the volts at the dynamo exceed the volts at the motor brushes. Were the above rational relation between dynamo and motor ratings generally followed, a variation in the ratio between different machines would indicate at once a variation in magnet-coil loss, efficiency or both.

The present variations in the relation between dynamo and motor ratings cannot be due to different efficiencies alone, as so great a range of efficiencies is neither practical nor possible. This can be shown by the machine of "A," rated at 10 horse power as a motor and 7.5 kilowatts as a dynamo, since a motor to deliver 10 horse power when drawing only 7.5 kilowatts plus twice its shunt-coil loss from the line must have about 96 per cent. efficiency, which, in a practical commercial machine of this capacity is very nearly impossible. Again, the machine of "C," rated at 10 horse power as a motor and 10 kilowatts as a dynamo, when drawing 10 kilowatts plus twice its shunt-coil loss from the line and delivering only 10 horse power would have an efficiency of only about 71 per cent., which is absurdly low. Taking the dynamo ratings of the machine mentioned to be correct, the motor rating of machine "A" is too high and that of machine "C" is too low, and it is absurd to offer these machines to do the same horse power of work, when one is one and one-third times greater in capacity than the other. If it be said that the motor ratings of these machines are the correct ones, then the dynamo capacities are incorrect in the reverse order.

In view of the several dynamo ratings quoted for machines of 10 horse power motor capacity, it is interesting to note the dynamo rating which corresponds to a 10 horse power motor, with the same amperes in the armature and the shunt-magnet coil, assuming the volts at motor and dynamo terminals equal. A motor working at the rate of 10 horse power delivers the mechanical equivalent of $10 \times 746 = 7,460$ watts, and at an efficiency of 86 per cent., which corresponds with good practice, the total watts delivered to the motor at full load is $7,460 \div .86 = 8,674$ watts. It is fair to assume about 250 watts in the shunt-magnet winding for a machine of this size, and since for the same amperes in armature and shunt coil the watts delivered to the motor may be greater than the rated watts of the corresponding dynamo by twice the amount consumed in the shunt coil, the dynamo rating for this case should be $8,674 - (2 \times 250) = 8,174$ watts. If, however, as is usually the case in practice, the motor must take energy from the line at about five per cent. lower voltage than that at which the dynamo is rated, the watt rating of the dynamo corresponding to the 10 horse power motor will be $8,174 \div .95 = 8,604$ watts. Dynamo ratings being more easily checked by volts and amperes than is the motor horse power, which is not so quickly determined, are probably more conservative and within desirable limits of heat.

Electric Street-lighting Extension in Chicago.

Contracts have been or are about to be let by the city of Chicago, to the extent of about \$150,000, for extending the municipal arc-light plants for street illumination. A new plant will be erected at Sixty-third street and Wentworth avenue, in Englewood, and existing plants will be extended. Two engines of 700 horse power each have been ordered from the Elmes Engineering company of Chicago at a total cost of \$12,375. They are of the vertical, compound-condensing type. One will go in the new Englewood plant and the other in the existing station at Halsted street and Blue Island avenue. Boilers for the new plant will be transferred from city plants where there is a surplus capacity, and none will be bought.

Ten 150-light arc dynamos are under contract at the low price of \$2,360 each. There will be five Brush machines, built by the General Electric company, and five Western Electric machines. Four dynamos will be placed in the new Sixty-third street station, two in the Halsted street plant, two in the station at Rice and Lincoln streets and two are as yet unassigned.

Bids have been received for the arc lamps, of which about 800 will be required. These lamps are to be of 2,000 nominal candle power each and planned for all-night service with single carbons 14 inches long and five-eighths inch in diameter. The bids for supplying each lamp are as follows: Charles E. Gregory, \$12.50; General Electric company, \$18.40; Western Electric company, \$19.30. The lamp contract had not been awarded at the beginning of this week. Specifications for wire and general line supplies will soon be issued.

Stealing Electricity.

By a verdict rendered by a jury in the Criminal Court of Cook County, Judge E. W. Burke presiding, on April 17th, the first conviction, after trial, was secured under the Illinois statute relating to the fraudulent taking of electric current from the wires of another. A defendant had been arraigned and pleaded guilty in a previous instance, but the case in question was the first in which the offense was proved to the satisfaction of a jury. The misdemeanor is a troublesome one to prove legally, owing to the intangible nature of the electric current and the difficulty of establishing that connections were willfully made to wrongfully divert the current. The case just decided was carefully worked up, and is of unusual interest.

The language of the law under which the prosecution was carried on is as follows:

Any person who, with intent to injure or defraud any company, body corporate, copartnership or individual, shall injure, alter, obstruct or prevent the action of any meter provided for the purpose of measuring and registering the quantity of gas, water or electric current consumed by or at any burner, office or place, or supplied to any lamp, motor, machine or appliance, or shall cause or procure or aid the injuring or altering of any such meter, or the obstruction or prevention of its action, or shall make or cause to be made with any gas pipe, water pipe or electrical conductor any connection so as to conduct or supply illumination or inflammable gas, water or electric current to any burner or office or place or motor or other machine or appliance from which such gas, water or electricity may be consumed or utilized without passing through or being registered by a meter or without the consent or acquiescence of the company, municipal corporation, body corporate, copartnership or individual furnishing or transmitting such gas, water or electric current through such gas pipe, water pipe or electrical conductor, shall be punished by imprisonment not exceeding three months or a fine not exceeding \$250, or both.

The complainant in the case was the Chicago Edison company and the defendants were Fred Potthast and Edward Bach. Potthast is a saloon-keeper and has or has had several places in Chicago, including one at 254 State street, where it was shown that current was stolen. Bach is an electrician, formerly employed by the Chicago Edison company, and he was employed by Potthast to connect the wires so that the consumption of current for lights would not be registered by the meter. Potthast and Bach were indicted, and the prosecution was conducted by Assistant State's Attorney Olson, with Roy O. West as special counsel. Mr. C. R. Taylor, an attorney associated with Mr. West, also gave material assistance to the state. The defense was represented by ex-Judge Longenecker and Mr. Arnold Heap. One of the interesting features of the case was the fact that the statute under which the case was prosecuted was drawn up in 1895 by Mr. Longenecker, the attorney for the defense, who was formerly state's attorney of Cook County.

The prosecution introduced maps of the basement in which the fraudulent connections were made, and, in connection with expert testimony, demonstrated by the use of a connection to the lighting circuit in the court-room that the electricity used was taken from the mains of the Chicago Edison company, showing the jury that by removing the plugs at the Edison company's service box the lights in the saloon were extinguished.

Another point in the testimony of the prosecution, which was introduced to prove that the connections were made to the Edison system, was that of blowing the service fuse by connecting the positive or negative wire to the ground, thereby extinguishing the lights in Potthast's saloon. This was due to the fact that, as the neutral wire of the Edison three-wire system is grounded, a direct short-circuit was caused on Potthast's lighting circuit. This method was explained by a witness, who, in company with other witnesses, visited Potthast's saloon the latter part of last December and extinguished the lights in this manner. Edward Bach, the electrician, was seen by witnesses in the act of wiring the premises and connecting lamps to the live wires. The prosecution also proved that Potthast had practically supported Bach for a year or two at his various saloons, and that the two had been very intimate.

The defense attempted to prove that the light was obtained from a small nearby plant. The difference in the light of the Chicago Edison company and that of the other plant was testified to by witnesses, who swore that the light of the Edison company was easily distinguishable from the other light, being of a steady, even quality, while that of the small plant fluctuated, owing to the use of a gas engine for motive power and the slipping of belts. Bach himself testified to an alibi, but the evidence did not support him. The jury, after retiring for less than half an hour, brought in a verdict of guilty for both defendants.

The number of cases in which the Chicago Edison company has been defrauded has increased to such an extent within the last few years that the company has been forced to protect itself by prosecuting all cases where intent to defraud the company is apparent. The company has several cases which will shortly come to trial, and it intends to vigorously prosecute all such offenders, with the hope that it may reduce its loss. It is known that there are electricians who solicit the work and obtain money for connecting lights to the company's mains, without its knowledge, in such a way that the lights do not register on any meter. It is said that these persons also sell appliances for placing shunts around meters.

DEVELOPMENT OF THE TELEPHONE FIELD.

History of the Telephone in Canada.¹

By W. L. SEWELL.

The Bell Telephone company of Canada was incorporated April 29, 1880, second session of the fourth Dominion Parliament, with a capital stock of \$500,000. Only limited rights were granted to manufacture, but the act gave the company the privilege of taking stock in manufacturing concerns. On the 17th of May, 1880, the original incorporation act was amended; and by this amendment the company was granted privileges to manufacture telephones and all other appliances connected therewith.

On March 10, 1882, an act to confer certain powers upon the Bell Telephone company was assented to by the Ontario government, and privileges in relation to the erection, construction and maintenance of its system were granted. On July 9, 1892, an act was assented to by the Dominion Parliament, granting the Bell Telephone company power to increase its capital stock, not to exceed \$5,000,000, including the original stock.

It was also provided in this act that the issuing of bonds and debentures from time to time should be limited to a sum not exceeding in the whole \$500,000, and that the then existing rates should not be increased without the consent of the governor in council.

By the original act of incorporation the Bell Telephone company was allowed to operate in every municipality in the Dominion. The act did not grant it an exclusive right; the system, however, to-day practically controls the telephone business throughout the Dominion. By an act passed July 23, 1894, the company was given the power to issue bonds or debentures to the amount of 75 per cent. of its actual paid-up capital. In 1891 capitalists in Toronto combined and applied to the City Council under the name of the Toronto Telephone company for the privilege of constructing and operating a telephone system in Toronto. As soon as this proposed company had made an offer to the city of Toronto the Bell Telephone company, realizing that the offer might be accepted, immediately made counter propositions to the city authorities, greatly reducing the previous rates and granting the city a percentage on all its gross earnings within the municipality in exchange for the exclusive privilege of operating in Toronto for five years and other considerations. The agreement entered into between the Bell Telephone company and the city corporation was substantially as follows:

The corporation agreed that it would not, during a period of five years, give to any person, firm or company permission to use any of the streets or lanes of the city for the purpose of placing in, upon or under such streets or lanes any poles, ducts or wires for the purpose of carrying on telephone business, the Bell Telephone company agreeing to pay to the city on December, March, June and September 1st of each year five per cent. of its gross earnings for telephone service within the city limits or any extension thereof, not to include the receipts for business transacted between the city of Toronto and the offices outside the city. The company further agreed that the rate to be charged for leases of telephones—to wit, dwelling houses within the city limits, for one year or more—should be \$25 per annum; similar leases for business houses, \$45 per annum; such rates to apply to all telephones then in use, as well as to those leased during the period of the contract. A pro rata rebate for the unexpired term was granted for telephones in use at the time of the making of the said contract, on which rent was paid in advance. The company agreed to place its wires under ground as rapidly as possible, with the exception of lines on small back streets, required for distribution purposes. The company further agreed not to allow any other person or company to use its poles without the consent of the city engineer and the approval of the council, except where the company has already existing contracts covering the use of poles. It also agreed to furnish the city with one duct from the conduits constructed in any of the streets, etc., to be used for the city fire-alarm service, making no charge therefor, and to give the city free of cost the use of any of its poles, when required, for the fire-alarm system. The company agreed to provide efficient telephone service, with all modern appliances, including metallic circuits, to the satisfaction of the city engineer.

The Bell Telephone company and the city of Toronto continued to act under this agreement for the period of five years, and at the expiration of the contract the company would not renew the agreement, and now declines to allow the city any percentage upon its gross receipts, so that, at the present time, it is operating under the rights conferred by the statute. The rates provided for in the agreement are charged. The system in Toronto consists of a main station and two exchanges, the single-wire system having been changed in 1892 to the double-wire metallic system. After the agreement was signed, all the lines in the central district were laid under ground, and a 2-5 mile, installed and substantially covered by aphalt pavement. In almost every case the installation of underground work preceded the laying of the asphalt. During the pe-

riod of the agreement between the telephone company and the city of Toronto the following sums were paid to the city treasurer:

Year.	Amount.	Year.	Amount.
1891 (2 months).....	\$1,172.46	1894.....	\$7,883.42
1892.....	7,303.43	1895.....	7,999.98
1893.....	7,455.67	1896 (10 months).....	6,791.78

These represented five per cent. of the gross earnings of the company during the five years.

Previous to 1891 the rates to subscribers were \$50 for business houses and \$30 for private telephones. From September 17, 1891, to the present time, the rate of \$45 and \$25, as per expired agreement, has not been changed. The present number of subscribers within the city is 8,300, with an average daily call of 13,02. Rates for long distances are charged according to a sliding scale, 25 cents being the lowest figure for five minutes' conversation. Direct telephonic communications can be had with the principal cities, towns and villages in the provinces of Quebec and Ontario and the United States. Up to 15 miles, rates are 15 cents; from 15 to 150 miles, 25 cents; from 150 to 225 miles, 50 cents. For each additional 20 miles or a fraction, half of the above tariff is charged. The telephone company, from 1880 to 1898, had plant in Toronto, "which does not include land and buildings, or \$306,220.21, the value of useless and ruined material which was not counted during its time," which appears to be worth about \$1,000,000.

The services rendered by the company are first-class, and all materials and equipments are in excellent condition in every particular. According to the directors' nineteenth annual report, 1,637 new subscribers were added during the last year, the total number of instruments now earning rental in the Dominion being 32,082. The company operates 343 exchanges and 340 agencies. Six hundred and sixty-six miles of wire has been added to the long distance lines in 1898. Of this 326 miles is in the Ontario department and 340 miles in the eastern department. Long-distance lines now owned and operated by the company comprise 17,233 miles of wire on 6,096 miles of poles. During the year 1898 they were divided among the shareholders at par 7,920 shares of new stock, in proportion of one share of new for four of old, all of which, with the exception of 160 shares, were sold and the premium divided pro rata.

The stock of the Bell Telephone company of Canada now sells readily at 178, whenever placed upon the market.

New England Telephone News.

[From the Boston correspondent of the Western Electrician.]

The Massachusetts Telephone and Telegraph company reports good results in the canvass for subscribers in Boston, and canvassers are still soliciting actively. President Holbrook has issued a prospectus, in the form of a handy pamphlet, declaring that the company is sanguine of success from present indications, and will undoubtedly have 15,000 telephones in operation within two years in the city of Boston, and a proportionate number in the suburbs. He states that there are more than 3,000 independent telephone exchanges in operation in the United States. The estimated cost of the construction of the system in Boston alone is about \$2,000,000.

The Cambridge City Council, at its last regular meeting, gave a hearing to the independent company on its petition for the privilege of establishing an exchange there, but reserved decision.

The Taunton (Mass.) Telephone company has been incorporated under the laws of the state, capitalized at \$50,000, with Peter H. Con, Clinton Sproat and H. H. Shumway named as incorporators.

Michigan Lines.

[From the Detroit correspondent of the Western Electrician.]

The Michigan State Telephone company has decided not to increase its capital stock from \$1,000,000 to \$1,500,000, as recently proposed. Instead, the managers will sell \$200,000 worth of unissued stock for the desired extension.

A strike of 150 linemen of the Michigan Bell company took place last Saturday in Detroit, and the strikers were to secure the co-operation of all the men working on the suburban lines about the city. They demand a uniform scale of \$2.25 per day, eight hours' work. It is stated as one of the grievances that the Detroit Telephone company, which for two years has been paying \$2.25 for ten hours' work, to-day signed the eight-hour agreement.

Mendacity of Bell Management.

The Bell interests have mailed circulars to subscribers of the Cumberland company, containing an attack upon the independent industry. The document purports to be an article reprinted from the Cincinnati Times-Star, and professes to give an account of the industry, but it is in reality a tissue of falsehoods, and is a disgrace to the newspaper which printed it and the company circulating it. One statement will fairly represent the character of the circular. It says:

"As a matter of fact, not a single opposition company in the country has ever paid a dividend."

Telephone Line an Additional Burden.

The Court of Errors and Appeals of New Jersey has had under consideration the question of whether the acquisition by a telephone company of a right to erect poles and place wires and other fixtures for telephonic purposes along a public street, wherein the fee of the land belongs to private persons, without the consent of such persons, is the taking of private property. It says that if the land were not subject to the easement of a public street the matter would not be debatable; but, it adds, it is equally clear that whenever the property of the owner of the fee in a highway is subjected by law to an additional servitude, it is taken, within the meaning of the prohibition of the constitution. This reduced the question in the case of Nicoll against the New York and New Jersey Telephone company to one as to whether the right to be acquired would be an additional servitude upon the fee, or was embraced within the public easement, and hence, grantable by the public for public use, without regard to the owner of the fee.

The argument to support the proposition that the right to construct and maintain a telephone line for common public use is within the public easement, the court states, is that the structures required for the exercise of the right are mere adaptations of the road to the passage of the electric current, which thus travels along the highway.

But the resemblance between this use and that ordinarily enjoyed under the easement, the court continues, scarcely goes beneath the words by which it may be described. In reality the electric current does not use the highway for passage. It uses the wire, and would be as well accommodated if the wire were placed in the fields or over the houses. The highway is used only as a standing place for the structures.

Such a use, the court says, seems to it to be so different from the primary right of passage as to be essentially distinct. Nor does it think that it rests on the same footing as those secondary uses which, though their relation to the right of passage is remote or even fanciful, are so generally advantageous to the owners of the fee—the owners of abutting property—that, rather by common consent and custom than by logical deduction from the primary design, they are now recognized as legitimate, such as the construction and maintenance of sewers, water pipes and gas pipes, for the convenience of persons occupying neighboring lands. Telephone lines in a street do not afford to the occupants of neighboring property such general convenience, nor have they been permitted such common and continued acquiescence as sanctions these other uses.

For these reasons, the court holds that the right of a telephone company to erect a telephone line within the limits of a public street, upon land the fee of which is owned by private persons, is not within the public easement, and can be acquired, against the consent of the private owner of the fee, only by condemnation under the power of eminent domain.

Proceedings to acquire such a right under the telegraph and telephone companies act of New Jersey, the court further holds, are regulated by the eminent-domain act.

Trials of Telephonic Apparatus.

[From the London Electrical Review.]

Experiments with new forms of telephonic apparatus, the results of which are duly published in the prospectuses of exploiters of the same, are often extremely misleading to the public, and also, we should add, to the experimenters themselves. We have, for instance, a statement that such and such a telephone has worked with great success through a length of 2,000 miles of wire, which to the public seems a marvelously good result, when they are ignorant of the fact that a very bad telephone would work equally well through 5,000 miles if the wire were of a sufficiently large gauge. The all-important element of gauge, in fact, being left out, makes the test practically valueless for indicating the true value of the instrument. Again, the (what ought to be) well-known erroneous method of testing through a looped wire with the transmitter and receiver at the same end of the loop, and without using earth, is by no means knocked on the head; it is often quoted as being a severe test, when it is actually perfectly useless. Tests through artificial cables are also by no means to be relied upon. These cables may be perfect as regards their K and their R, and may be entirely satisfactory for experiments on telegraphing through cables, but for telephonic experiments they are not to be relied upon, as there is often a reaction between the bobbins of which the resistances are composed, which, for telephonic purposes, practically cuts down the effective length of the cable to a very marked extent. In fact, we are actually working through K R, diminished by inductive reaction, this reaction being by no means an inconsiderable quantity. The only test of real value is to pit one telephonic instrument against another through the same artificial cable, and determine which is the better of the two by adding in resistance and capacity until one of the two on trial commences to fail. We have seen this done on more than one occasion, to the complete discomfiture of the vaunted improvement.

¹ From a pamphlet issued by United States Consular Reports.

Telephone News from the Northwest.

[From the Minneapolis correspondent of the Western Electrician.]

The St. Paul Board of Aldermen has finally yielded to the demand of the business men in that city and granted the American Telegraph and Telephone company a franchise for a local and long-distance telephone connection. The franchise of the present local company expires soon, and the council has felt that to grant the long-distance company a local franchise would be the same as extending the present company's, owing to the close connections of the two companies. But the business men wanted long-distance connection, and petitioned for it and kept up an agitation until favorable action was taken. The franchise provides that no stock in the company can be transferred without the consent of the council.

The Standard Telephone company has connected McGregor, Ia., with neighboring towns.

The Germania Telephone company has been formed at Germania, Ia., with \$5,000 capital stock, to build toll lines over Kossuth County. The same incorporators have formed the Northern Kossuth Telephone company.

The Northwestern Telephone company of Sheboygan, Wis., has been reorganized as the Sheboygan County Telephone company. All the floating stock has been gathered in by local business men, to prevent the absorption by the Wisconsin Telephone company of the company.

The Little Wolf River Telephone company has secured quarters in Fond du Lac, Wis., for the central office for the exchange about to be established.

The Winona (Minn.) Telephone company has 536 instruments in service in Winona, and a total of 670 with the toll lines.

The Wisconsin Telephone company suffered \$2,000 damage at Oshkosh, Wis., in a recent heavy fire, by reason of 400 wires being melted by the heat.

The Western Electric Telephone company of Algona, Ia., expects to rebuild its lines in that vicinity on a metallic basis and make numerous extensions.

The Wright County Telephone company has been granted a franchise at Belmond, Ia.

The Nevada Mutual Telephone company has been incorporated at Nevada, Ia., with \$3,500 capital stock. Contracts have been let for constructing the new telephone system at Garner, Ia.

Chase & Achatz will soon rebuild the telephone system at Algona, Ia.

A mutual telephone company has applied for a franchise at Humboldt, Ia., and the Iowa Telephone company has renewed its request for similar privileges.

The Home Telephone company of Sioux City, Ia., is building a toll line to Spirit Lake, Ia.

Arrangements are about completed for a farmers' telephone line between Keota, Ia., and South English.

The Wisconsin Telephone company is preparing to put in a metallic circuit north from Two Rivers, Wis., to Sturgeon Bay.

The Northwestern Telephone Exchange company has made an experimental low rate between the Twin Cities and Fargo of 25 cents for a day message of one-half minute.

The People's Telephone company of Superior, Wis., is now in full possession of its franchise for a local exchange. It is to have not less than 100 instruments in use by August 1st.

Work has been started on the long-distance telephone company's line between Superior and Minneapolis.

A local telephone company is being formed at Montevideo, Minn. Over 40 subscribers have been secured.

The Northwestern Telephone Exchange company will begin work on improvements to the system at Grand Forks, N. D., and vicinity about May 1st, and will continue all summer rebuilding the local exchange.

Farmers and merchants of Prospect, Wis., will build a telephone line to Big Bend, Wis., to connect with the Wisconsin Telephone company's lines.

An additional switchboard of 50 drops has been put in for the Valley City, N. D., telephone exchange. The exchange has 153 subscribers. An exchange is projected by Manager Beaman of the Valley City exchange, to be established for Coopers-town, N. D.

The telephone company of Lake Mills, Ia., has added 10 cents a month to the cost of service, making it 70 cents for business houses and 50 cents for residences.

The Ogden (Ia.) Telephone company, composed of local people, has been formed and materials for the exchange ordered.

Brighton, Ia., has voted a franchise to the Jefferson County Telephone company.

The Rocky Mountain Bell Telephone company is preparing to do a large amount of work on its lines this season. The Dillon, Mont., line will be extended south to connect with the Utah system. Lines will be extended from Sheridan to Virginia City, Mont., at once.

The Michigan Telephone company has materials at Menominee, Mich., for a metallic-circuit extension to the copper country in the Upper Peninsula.

The business men of Tracy, Minn., came to the conclusion they had no use for telephones in their stores, and ordered them out, but desired to retain their residence connections. The company announced that it might as well take out the entire exchange as to remove the business connections, and

issued an ultimatum to the business men to that effect.

The Bon Homme County Telephone company has been granted a franchise in Bon Homme County, S. D., and expects to connect distant towns in the county with Tyndall, the county seat.

Senator J. T. McGowan of the Minnesota Legislature has been investigating the matter of telephone rates in several cities.

Telephony in Mississippi.

[Special correspondence of the Western Electrician.]

The Canton Warehouse company, which also owns the telephone plant at Canton, Miss., and over 200 miles of lines throughout the adjacent country, recently sold its telephone business to the Cumberland (Bell) company, which had unsuccessfully attempted to put in a local exchange in order to secure the toll business for the trunk and local lines recently completed between New Orleans and Memphis. The people stood by the home concern, even in the face of the Cumberland's offer to put in telephones free of charge. The Cumberland company secured only 23 subscribers, with a solicitor in the town nearly three months, while the home people had over 130 local subscribers. After the Cumberland company bought out the plant it raised the business rate from \$2 to \$2.50 per month and discontinued free service to the adjacent country, which the local company had been furnishing to its subscribers without charge.

At Crystal Springs, Miss., the Citizens' Telephone company continues to increase its business, although already having a good list for the size of the town in which the exchange is located. The business in the adjacent country is also increasing.

The Hazelhurst company, after a contest with the Hazelhurst, Miss., authorities as to their privilege of installing a local exchange, finally came to terms with the Town Council and, by the terms of its franchise, agreed to furnish the citizens service at rates which will be fairly satisfactory, but, notwithstanding this, the Cumberland company is not making very much progress with the local exchange. Meanwhile the agitation seems to have benefited the local concern, whose business has been considerably increased since the Cumberland company came into town.

McComb and Summit, Miss., are situated only about three miles apart, and the Cumberland company is installing exchanges at both these points, but the fight has not been on long enough to determine what will be the measure of their success, though it is quite probable that the home people, especially at McComb, where the independent concern is in strong hands and has a very large list of subscribers, will probably hold their own.

Since the local telephone company at Natchez, Miss., sold out to the Cumberland (Bell) company in January last, as previous reported, the rates have been advanced to \$2 for residences and \$3.50 for business telephones, being an advance of 50 cents on residences and \$1 on business houses from the rates charged by the home concern.

Both the Cumberland company and the Citizens' company at Vicksburg, Miss., continue to hold just about the same number of subscribers as they have had for some months past, although the Cumberland company offers a 50-cent residence rate.

The Mutual Telephone company at Yazoo City, Miss., continues to hold its own, occasionally adding more subscribers, while the Cumberland company has only a few subscribers.

In Jackson, Miss., the People's Telephone company, which has nearly three times as many subscribers as the old Bell company had when the People's began operation, still picks up a few subscribers from time to time. The independent company has a great many more business concerns than the Cumberland company, and while the Cumberland has as many residences, yet the better class is nearly all found exclusively on the People's line.

The company operating the local exchange, which recently reorganized at Meridian, Miss., is doing a very good business, continually gaining new business, and is very favorably regarded by the general public, though a great many of the business concerns still find it desirable to keep both the local and the Bell company telephones. C. M. H.

The Cumberland Telegraph and Telephone company has lately put a telephone exchange in Greenwood, Miss., in competition with the one installed by George W. Scheuing of Memphis. Mr. Scheuing has cut the price to \$1 per month, and is holding his subscribers.

L. B. Camp of Amory, Miss., an old telegrapher, has about completed an exchange of about 50 telephones. He has a 100-number switchboard installed.

The Tennessee and Arkansas Telephone company will in a few days put under the water of the Mississippi River, at Richardson's Landing, Tenn., a two-conductor cable, manufactured by the Standard Underground Cable company of Pittsburg. The lines of this company run in Tennessee to Richardson, and from there in Arkansas through Osceola and on to Barfields. R.

Telephone Beats Telegraph.

[From Iron Age.]

The telegraph is too slow for modern business methods. At least that is the experience of a western dealer in old rails. It happened on a recent

holiday that two dealers in the same city went to their respective offices to look over their morning mail. Both received an offer of a lot of old rails from a railroad manager 200 miles distant. Mr. A immediately called up the railroad manager by long-distance telephone, caught him in his office, and in a few minutes closed the transaction, involving about \$50,000. Mr. B meanwhile called a telegraph messenger and sent a telegraphic offer for the rails. The telegram was delivered at the manager's office in due time, but as he had gone home it was held over until the following morning for his scrutiny. Mr. A, however, suffered no grass to grow under his feet, but on the same holiday called up a rolling-mill 400 miles away, found the manager ready for business and sold the rails, thus cleaning up a profitable transaction within comparatively few hours, and long before the message sent by telegraph reached the person addressed. It is unnecessary to state the moral, as this is no fable.

New York Telephone Rates.

The New York Telephone company will put into effect on May 1st a general reduction in its rates of service. The rate for a telephone in a private house is to be reduced from \$90 a year to \$60 a year. The rate now prevailing permits the sending outward of 500 messages, which is equal to 15 cents a message. More than six months ago the rate for a message from a pay station was reduced from 15 cents to 10 cents within Manhattan Borough, but no change was made in the house rate. Thus it cost 15 cents to telephone from home, while by going to a pay-station a saving was effected of five cents.

In Brooklyn and New Jersey, where telephones are operated by what is to all intents and purposes the same company, the house rate is \$50 a year for 500 messages. A reduction was made one year ago from \$65 a year. Rates are even lower in parts of New Jersey where there is competition.

It is said that the new scheme of reduction contemplates a lowering of the rates for business houses, both for the long-distance and the ordinary city service, but the figures cannot be learned.

It is believed that the organization recently of two or three corporations with large capital, which announced that they would enter the field as active competitors of the existing companies, and which have been assured of right-of-way under the city streets and also of generous patronage, has moved the New York company to lower its rates.

No Consolidation of Independent Companies.

The report that Hopkins J. Hanford who was in New York for a few days recently, was arranging for a combination of the independent telephone companies, has been formally denied. It was said that one of the largest banking houses of New York had agreed to finance the consolidation, which would involve a capital of about \$20,000,000. Mr. Hanford says the independent companies are not ready for consolidation; that such a movement could not now be successful, and that it will be two or three years before it can be contemplated.

MANUFACTURERS AND DEALERS.

J. A. Williams, president and general manager of the Williams Electric company of Cleveland, is spending a few days in Chicago, in the interests of his company. Mr. Williams is stopping at the Great Northern Hotel.

Mr. P. C. Burns has decided to publish a monthly house organ to promote his several telephone interests. The first number contains a full-page portrait of the publisher and several illustrations of apparatus made in his factories. The new publication is called the American Telephone, and is modeled on the same lines as the defunct Telephone, formerly published by Mr. Keelyn and his associates.

C. H. and Gus Hintz are promoting a telephone line between Chico, Cal., and Magalia, taking in intermediate towns. A petition for the privilege to maintain poles on the streets of Chico has been filed with the city clerk, and a similar one will be presented to the supervisors, asking for the privilege of setting poles along the county road. It will cost between \$600 and \$700 to construct the line. Work on the construction of the line will be begun soon.

The Monarch brand of galvanized telephone wire is meeting with great success, and it is said, has given satisfaction wherever used. This wire is made exclusively for telephone purposes, and is put up in half-mile bundles. The Loschen Macomber-White company carries a large stock in Chicago. The company also handles galvanized steel strand, Crosby clins turnbuckles and Boston cable hangers, all of which it carries in stock.

The Eriesson Telephone company of New York has issued a new catalogue, presenting the merits of its specialties. The company announces to the independent telephone exchanges a series of information letters which will be mailed from time to time, in circular form, to all who may be interested. They are free of cost, and those who wish the full series should mail the company a postal or letter to that effect. The company will occupy its new offices, 206 Broadway, New York, about May 1st.

Knutson Gravity Clutch for Arc Lamps.

Electric-light managers and users of arc lamps in general will be interested in the Knutson gravity clutch for arc lamps, which is illustrated herewith. Every arc-lamp trimmer in the country has experienced more or less difficulty in connection with clutches, and these difficulties are said to be entirely overcome where the Knutson clutch is used. The clutch is very simple, and was devised by Alfred W. Knutson of Galesburg, Ill., after an experience of 15 years with arc lamps. It is claimed to possess many points of superiority over other clutches, and although in practical use but a short time, it is said to have an entirely satisfactory record.

The device is especially adapted for Thomson-Houston and Brush arc lamps, and can be readily fitted in arc lamps without taking the mechanism of the lamp apart. It can be readily engaged with, and disengaged from, the carbon rod without removing the upper end of the rod. The clutch, while firmly holding the rod, is at the same time exceedingly sensitive, so as to readily release its grip from the rod to allow the latter to feed at the proper time. The clutch has only one pivotal hinge, and has no lost motion. It has a sure grip and is sensitive to feed. It will not pit a rod, and will take up the full arc instantly after feeding, thus insuring a brilliant, steady light. Moreover, it is said that the clutch will last as long as the life of the lamp and that the life of the lamp will be prolonged, as it is impossible for the rod to bind and the coils to burn up. Mr. Knutson, the inventor, has been an arc-lamp trimmer, and his wide experience has enabled him to overcome the difficulties of arc lamps caused by inefficient clutches.

A. W. Knutson & Co., Galesburg, Ill., who are manufacturing this clutch and placing it on the market, are anxious to have every electric-light company give it a trial, and guarantee it to be absolutely satisfactory. The firm is willing to send a trial order on approval, and if the clutches are not satisfactory they may be returned.

Relay Circuit-breaker.

The illustration shows a type of circuit-breaker equipped with two magnets. One is arranged for opening the circuit at a predetermined overload, and the other is wound with a number of convolutions of fine wire, to be placed across the line circuit and to be used in connection with one or more push-buttons for opening the circuit at various points distant from the instrument. This magnet may also be wound for almost any voltage and to open at rise of voltage above a predetermined limit.

The instrument shown is single-pole, but it can be made double-pole by placing another switch at the right of the overload magnet, both latches being tripped at overload by the same plunger. The Ward

has numerous other orders for large work. The works are so crowded that the company has been obliged to contract for the extension of its shops, the contract having been let and work progressing. These extensions more than double the present plant. The plans contemplate the extension of foundry, machine shops and erecting shops to double their present capacity, besides which the power house, smithy and forge departments are to be trebled in capacity. The company is also building a warehouse for finished product, 400 feet in length. These improvements will make the machine shops, erecting shops and foundry 1,200 feet in length, with the present width of 230 feet. The warehouse



KNUTSON GRAVITY CLUTCH FOR ARC LAMPS.

and forge department will be nearly 700 feet in length.

For very large work the Westinghouse company will build Corliss engines, but for the present, at least, it will build no moderate-sized Corliss machines.

Electrical Equipment for Street Railways in Mexico.

The company owning the street railways in Mexico City is about to substitute electric power for animal traction, according to United States Consul-general Barlow. There are about 300 miles of track in

H. P. Bradford is president. The conductors and drivers are Mexicans.

The franchises granted are about the same as in other cities. The capitalization is \$10,000,000. The street-car fares vary according to distance. In the city proper they are five and six cents. Some of the suburban fares are as high as 30 cents.

The electric power will be obtained from coal. There will be no connection with the electric-light plants now in operation.

Fort Wayne Electric Manufacturing Company.

It is authoritatively announced that the Fort Wayne Electric Manufacturing company is being organized as the successor of the Fort Wayne Electric corporation, and that the business will be continued as heretofore at Fort Wayne, under the direction of Messrs. Wood and Hunting, with improved facilities for manufacturing.

CORRESPONDENCE.

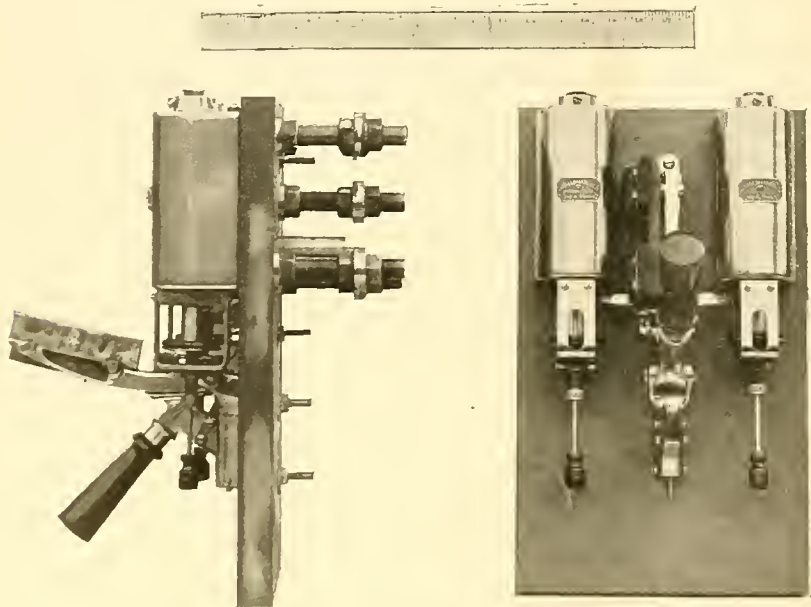
New York Notes.

New York, April 24.—The amended rapid-transit law is still pending in the Legislature. Governor Roosevelt has sent a message to the Senate and Assembly at Albany, stating that, in his opinion, the franchise should not be given for more than 50 years. He is opposed to a perpetual franchise. If the people approve a constitutional amendment separating the debt of New York city from that of its constituent counties, the city may be permitted to build the terminal road itself, the debt limit being thus extended. Were the constitution so amended, Controller Coler asserts that the city could easily devote \$10,000,000 a year for the tunnel without in any way interfering with the municipal improvements already contemplated. The Tribune says that public opinion is confessedly in favor of delaying the beginning of the tunnel for a few months rather than accepting such exacting demands as were made by the Metropolitan company. It was this knowledge which led Mr. Whitney and his associates to withdraw their offer. But, despite the aggrieved attitude which they take, it is generally believed that when the time comes for the city to invite bids for the contract one of the competitors will be a syndicate of Metropolitan railway capitalists.

It is said that the Sprague multiple-unit system of electric-car propulsion will be adopted by the Manhattan Railway company, and that all idea of extending the elevated structure north of the present termini has been abandoned. Instead, the Manhattan company will operate its cars in the upper part of the city on the tracks of the Union Railway company, which is in harmonious relations with the Third Avenue Railroad company. The Sprague method enables cars to be run either in trains or as individual cars, and the plan contemplated is reported to be to run its trains to One-hundred-and-seventy-seventh street on the East Side and One-hundred-and-fifty-fifth street on the West Side, where they will be broken up, descending a grade to the street level as individual cars, and thence going over the tracks of the Union Railway company to various points in Westchester County.

The Municipal Street Railway company of New York city was incorporated last week with a capital stock of \$250,000, to construct a street surface railroad about nine miles long. The termini of the road are One-hundred-and-sixteenth street and Eighth avenue, Kingsbridge Road and West Two-hundred-and-thirtieth street and Riverdale avenue and the northerly line of New York city, and there are to be branches to connect the main line with the junction of Eighth avenue and One-hundred-and-twenty-fourth street and the junction of Eighth avenue and One-hundred-and-forty-fifth street. The directors are James D. W. Cutting, James W. Gerard, Jr., Robert McM. Gillespie, Arthur C. Hume, Thomas Stokes, Charles A. Hamilton, John B. Stewart, M. L. Bouden and William E. Findley of New York city. The new company, in order to get the franchise, will have to get the consents of a majority in value of the property-owners along the line and the consents of the city authorities and the Rapid Transit Commission. It is declared to be the intention of the company to operate an electric road on a three-cent-fare basis in connection with the rapid-transit road's express trains.

The Staten Island Rapid Transit railroad was sold at auction on April 20th. It is understood the purchasers represent the Baltimore and Ohio railroad. The road runs from St. George to Arlington on the north shore and to South Beach on the south shore. It connects at St. George with the Staten Island ferry which is an independent corporation. At Clifton it connects with the Staten Island railroad which runs to Tottenville, and which it has operated under lease for some years. The sale included all the property of the company including a portion of the ferry. The only bid made was \$2,000,000, and at this price D. T. Cornell who conducted the sale, knocked the property down. The present management of the road, it is said, will continue. The policy and traffic schedule are to remain as in former years. The Staten Island Rapid Transit Railroad company owned and controlled one-half of the Staten Island Ferry company. The other half is held by the Staten Island Electric com-



RELAY CIRCUIT BREAKER.

Leonard Electric company of Bronxville, N. Y., which is prepared to furnish circuit-breakers suitable for nearly every kind of service, is the manufacturer of this device.

Westinghouse Company to Make Corliss Engines.

The Westinghouse Machine company of Pittsburg has recently secured a number of large orders for steam engines of very large capacity, notably the equipment of the Third Avenue street-railway power plant now building in New York, there being 16 engines of 4,500 horse power each, with a maximum capacity of about 7,000 horse power each, in this plant alone. Besides this plant, the company is building two engines of the same capacity for the Bay Ridge plant of the Brooklyn Edison company, and

the district, which includes the city. One line of 1½ miles is called the "Baños" or Baths line. The rest belongs to the Compañía de Ferrocarriles del Distrito Federal.

Until recently mules have been used to move the cars. They are small, hardy, well-fed animals, and travel rapidly. On the outskirts of the city their usual gait is a gallop. For communication with suburban towns the company has some large 16-wheel cars. Arriving at the outskirts of Mexico City, these cars are coupled into trains of five or more cars, and are thence drawn at good speed by American dummy engines. Most of the cars of the company are constructed in the United States, though at the city workshops of the company they make all repairs and have built some cars. The steam suburban lines will probably be retained and used chiefly for freight. The management is American.

pany, which operates some of the electric railroads on the island. M. S.

Detroit, Mich.

Detroit, April 24.—The Detroit Public Lighting Commission has decided to install closed arc lights. Many of the trimmers will be thrown out of employment.

Dan L. Davis of Pontiac and A. A. Talmadge of New York have been before the City Council at Holly, Mich., trying to secure a franchise for an electric railway. The council wants a forfeit of \$5,000 that the road shall be built by next fall. The intention is to run a line from Holly to Pontiac.

The electric road from Ann Arbor to Saline will be built this spring. A change in the route has been made.

The City Council of Battle Creek has decided to assess the street-railway company for any damage to water pipes caused by electrolysis.

In the annual report of the Eastern Asylum for Michigan Insane at Pontiac it is announced that the lighting plant now operated in the building has made a saving of \$4,000.

Representative J. N. McLeod's bill at Lansing, requiring all street-railway cars to be equipped with air brakes, has met with considerable opposition by the street-railway companies. Detroit and Grand Rapids companies are lobbying against the bill.

The Detroit, Mount Clemens and Marine City electric road has been incorporated for \$600,000.

The incorporation of the Detroit and Orion electric road is being "held up" in the secretary of state's office. The question is raised whether such roads can be operated from town to town through different counties. It will be taken to the Supreme Court to decide. G.

Northwestern Notations.

Minneapolis, April 24.—The Humboldt (Ia.) Electric Light and Power company has placed orders for equipment for its new system.

A bill has been introduced in the Minnesota Legislature allowing cities to contract for electric lighting for five years, the plant to be transferred to the city at the end of that time, free of charge.

W. A. Holt has made a proposition to the city of Oconto, Wis., to install an electric-light plant and light the streets for \$3,600 per annum, of which amount \$2,400 is to apply on the purchase of the plant by the city.

The council of Elroy, Wis., will probably be petitioned to submit the matter of an electric-light franchise to the public.

The litigation between the city of Tacoma, Wash., and the Commercial Electric Light company has been ended and the matter settled on the basis of the agreement made several weeks ago. The city has received \$100,000 cash in the settlement.

Local capital at Mankato, Minn., is taking an interest in an electric car system for that city. Eastern capitalists have made an offer for a system, conditional on a stock subscription of \$10,000 to \$15,000.

The Twin City Rapid Transit company recently paid to the city treasurer of St. Paul \$8,064.07. This includes three per cent. on gross earnings, real estate and personal taxes.

The Electric Light company of Missoula, Mont., offers to contract to furnish electric lighting for 10 years at the rate of \$8.33 a month each for 30 lights. The company's present contract does not expire until next September, and calls for \$15 per month per light. The company explains that the cost of lighting is cheaper now and present conditions justify the reduction.

The city of Aberdeen, S. D., has made a proposition, which has been accepted, for the purchase of the electric-light and gas system. The plant is bonded for \$35,000. The city will assume this debt and pay the owners \$3,500.

A new dynamo of 1,250 lights capacity is about to be put in for the electric-light plant at Pipestone, Minn. It is double the capacity of the present dynamo.

B. H. McCray of Browns Valley, Minn., is an applicant for a franchise for electric lighting at Osakis, Minn.

The St. Cloud (Minn.) street railway finds this a profitable year. There has not been any money expended for removing snow, and the extreme cold has made a large number ride who ordinarily walk. As the company has had hard sledding to keep a balance on the proper side, and frequently has failed to do so, this is pleasing to the management.

The Keelyn & Smith General Electric company of Milwaukee secured the contract to furnish the electric equipment for the municipal electric plant for Boscobel, Wis., at \$2,173.

The Humboldt (Ia.) Electric Light and Power company has been incorporated to establish an electric-light plant.

N. H. Crowell has been appointed receiver for the Sioux Rapids Electric Light and Power company of Sioux Rapids, Ia.

An amicable agreement has been reached at Chippewa Falls, Wis., between the Chippewa Valley Electric Railway company and the Wisconsin Central Railroad company, and all litigation over the disputed right-of-way will cease.

The council committee on electric lighting at Co-

lumbus, Wis., recommends the issuance of \$10,000 bonds for the construction of an electric-light plant.

M. J. Mandelbaum of Cleveland, O., has been granted a franchise in Stillwater, Minn., for the construction of an electric interurban line to St. Paul and Minneapolis; also for a local line. The Twin City Rapid Transit company was also an applicant for the franchise, but refused to construct a local line. Finally, when Mandelbaum came into the field, the Twin City company agreed to the local line, but it was then too late, for the council has agreed to the Mandelbaum proposition.

A reformer in the Superior, Wis., City Council proposed an ordinance making it an offense for any city official to use passes on the street-railway lines. The council voted it down with an overwhelming vote.

The consolidation of all the street-railway companies in Sioux City, Ia., under one management has been effected. There are a number of improvements contemplated.

The council of Neenah, Wis., after favoring first the Citizens' Traction company of Oshkosh and then the Fox River Valley Electric company of Appleton, has finally pledged itself to grant the former company a franchise as soon as the matter can be got into shape to be done legally. The company is also authorized to proceed to award contracts for work and materials.

H. F. Whitcomb and others are desirous of having the franchise for an electric-car system in Fond du Lac, Wis., amended, and offer to construct a system if it is done.

Stilwell & Bierce of Dayton, O., have secured an option on the Apple River Falls water power, near Hudson, Wis., and propose to transmit the power to Stillwater and St. Paul, Minn.

The street-railway company of Sheboygan, Wis., contemplates extending its system to Sheboygan Falls.

Charles Bowick contemplates putting in an electric-light and water-works system in Ward, S. D.

F. R. Lloyd has been granted a franchise for an electric-light plant at Kasson, Minn., and will proceed to put it in at once.

The agents for the St. Louis Water Power company of Duluth, Minn., announce that work will be begun soon to develop the power and transmit it by electricity to Duluth and Superior.

Negotiations have been completed for the consolidation of the Green Bay Gas and Electric, the McCartney Electric Light and the Fox River Electric Lighting companies at Green Bay, Wis., under the title of the Green Bay Gas and Electric Light company.

The Twin City Electric company has been incorporated at Grand Rapids, Wis., to supply light for Grand Rapids and Centralia. The company is co-operative and has a local company to compete with.

The Electric Light, Power and Telephone company of Garner, Ia., has been incorporated, with \$10,000 capital stock.

A stock company is to be formed at Cambridge, Minn., to absorb the Gouldberg and Anderson electric-light plant and enlarge it to meet the needs of all the village.

The street-railway company of Burlington, Ia., offers to make the extension of its lines to West Burlington, as requested, if the council will extend its street-lighting contract for 10 years, and offers a reduced figure for lighting. The company says that the proposed extension will not pay at first, and asks the extension of the contract to make up for the loss which would ensue.

Nathan O. Ross sued the cities of St. Paul and Minneapolis for alleged infringement of a patent electric-magnetic tripping and recovering mechanism, used in releasing horses in fire-department service when an alarm is received. He sued to ascertain the savings, profits and gains accruing from the use of the device. The special master in chancery, Henry D. Lang, heard the case and awarded Mr. Ross damages of \$1 from each city, considering the damages as merely nominal.

The Commercial Club of St. Paul is working to secure the establishment in that city of an electrical supply house.

A resolution was introduced in the St. Paul Council asking the Legislature to pass an act permitting cities of over 100,000 population to prohibit street-car companies from collecting fares from passengers unless the latter are provided with seats and reducing the fares between 6 and 9 a. m. and 5 and 7 p. m. to three cents. It was smothered by reference to a committee, which it was expected would not report until after the Legislature had adjourned.

The Baker franchise for electric power, which has been before the council of Tacoma, Wash., for nearly a year, has finally been granted.

The Tri-city Railway company has asked for an extension of its franchise in Davenport, Ia., for 25 years. The company has bonds falling due soon, and wants its franchises extended in order that it may be in a position to issue new bonds and improve its system.

The Hildreth electric-light plant at Charles City, Ia., has been sold to A. L. Dodd, and will be consolidated with the other electric-light plant there.

A resolution has been offered in the City Council of Superior, Wis., declaring the franchise of the Superior Rapid Transit company void. It cites that

the company has failed to run cars as the franchise requires. The company is in the hands of a receiver at present, and the belief is that it is doing as well as it can under present conditions.

Louis Wiese of Davenport, Ia., picked up a loose wire in the alley behind his livery barn. While carrying it, the wire came in contact with a live wire, and Mr. Wiese fell to the ground at once. Help was near and he was soon released, but not before he received burns on the hands and forehead.

An ordinance has been offered in the Minneapolis council extending the underground district for wires materially, and requiring that the telegraph, telephone and electric wires in the district included shall be underground by July 1, 1900.

The Riceville (Ia.) Electric Light and Power company has been incorporated, with \$10,000 capital stock.

The Citizens' Traction company of Oshkosh, Wis., announces that it will push matters in the construction of the interurban line to Neenah, and expects to have the line in operation by July 1st. George K. Kobusch, president of this company, announces that he has just closed a contract with the Third Avenue Railroad company in New York city to furnish 300 electric cars. Each car is worth \$2,200.

E. A. Young, a prominent St. Paul wholesaler, has applied for a franchise for an electric road from St. Paul to White Bear Lake.

There is talk in Minneapolis of converting the West Side pumping station into an electric-lighting plant. The station has 300 horse power from the water power, which would be quite an aid in furnishing street lighting. Nothing definite has been done in the matter, but the change is under consideration.

Major R. C. Bement of St. Paul has been appointed manager of the Water, Light and Power company of Superior, Wis., succeeding ex-Governor W. R. Merriam of St. Paul. The latter has been appointed director of the census.

The Cannon Falls (Minn.) Electric company announces to its patrons that it is negotiating for the purchase of machinery of about twice the capacity of the present equipment, and expects to have it installed soon.

The Electrical Workers' union in St. Paul will endeavor to have a bill passed by the state Legislature, providing for licensing masters, journeymen and specials.

C. S. Barlow and others have made application to the council of Tacoma, Wash., for a franchise for a street-railway system, to be operated by power from the Snoqualmie water power. The system, as proposed, means the expenditure of about \$100,000 in the city. A counterweight device will be used in overcoming the Seventeenth street hill.

The official report of the city recorder of Moorhead, Minn., for 11 months ended March 1st, shows the water and electric-light plant to have a surplus of \$818, after repairs and new construction to the amount of \$1,133 had been paid.

The differences between the city of Algona, Ia., and the contractor who put in the electric-light plant have finally been settled. The city has all along contended that the engine was not up to the specifications, and the contractor denied it. The latter died recently, and the settlement was with his estate.

The council of Minneapolis awarded the contract to the Minneapolis General Electric company to furnish street lighting at \$108.50 for all-night service and \$82 per light for a moonlight schedule.

The electricians of the Twin Cities, to the number of about 100, sat down to a banquet at the West Hotel, Minneapolis, recently. Toasts were responded to on electrical topics, and a very enjoyable time was had.

The city electric-light plant of Grand Forks, N. D., cost to operate for 46 days, from December 14th to February 1st, \$27,435, running 402 hours and lighting 84 lamps.

A company of Tacoma, Wash., is understood to be preparing to construct a dam and develop water power to produce 40,000 horse power at Lake Tapps.

A number of discharges among the older men of the street-railway employes in Duluth, Minn., leads the men to think the company is trying to break up the union. The company denies any desire to break up the union, and says the discharges were all for cause.

Stone & Webster of Boston have been granted a franchise for an electric line in Hancock, Mich. They propose to build a line to connect the towns in that vicinity, and expect to begin work as soon as the weather will permit.

B. H. McCray will establish an electric-light system in Osakis, Minn. He has been granted a franchise for five years. Work will be begun at once.

The earnings of the Twin City Rapid Transit company in Minneapolis and St. Paul for 1898 were \$2,145,002.05. The net earnings were \$1,010,302.14. The percentage of operating expenses to earnings was 46.96, or, including taxes, 49.92.

There is talk at Rat Portage, Ont., of developing the water power there and transmitting it by electricity to the mines within a radius of 60 miles.

The city of Mayville, N. D., is taking bids, until April 5th, for constructing an electric-light and water-works plant.

The council committee on electric light at Albert Lea, Minn., favored installing a municipal electric-light plant.

There is a proposition to put in an electric-light plant at Holmesville, Neb., to be operated by water

power, from which light would be furnished for Blue Springs and Wymore, Neb.

A bill is before the Minnesota Legislature giving county commissioners the right to allow the building of electric railways along country roads, under certain conditions.

The Twin City Rapid Transit company announces a raise in wages to all conductors and motormen in Minneapolis and St. Paul to 18 cents an hour. Those entering the service will be paid 16 cents an hour for the first six months, 17 cents an hour for the second six months and 18 cents after the first year.

PERSONAL.

A cable dispatch from London announces that Signor Marconi, the distinguished electrician, whose experiments in wireless telegraphy have aroused a world-wide interest, will visit the United States next October.

H. L. Doherty, the president of the Northwestern Electrical association, called on his Chicago friends last week. Mr. Doherty is already planning to make next year's convention of the association the most successful in its history.

W. J. Clarke, general manager of the General Electric company's foreign department, has sailed for Europe. He will remain four months to extend the field of his department and to superintend the installation of General Electric apparatus on London, Bristol and Dublin railways.

Mr. A. P. Trotter, for six years editor of the London Electrician and later electrical adviser to the colonial government at Cape Town, has been appointed electrical adviser to the English Board of Trade—a responsible and difficult position, until recently held by Major Cardew. Mr. Trotter is an engineer of ability and a writer of much force and charm. His friends are congratulating him and themselves on his return to England.

Announcement is made of the marriage of Mr. J. R. Cravath and Miss Ruth Myra Rew, at Grinnell, Iowa, on April 19th. Mr. Cravath is an electrical engineer of Chicago and a well-known contributor to electric-railway literature. The Western Electrician extends congratulations to the young couple, and voices the good wishes of many friends for a happy and prosperous career. Mr. and Mrs. Cravath will be at home at 5519 Monroe avenue, Chicago, after June 1st.

Colonel Danforth Phipps Livermore of Hallowell, Me., probably the oldest telegrapher in the country, died on April 19th. Colonel Livermore was in his 95th year. He had long been identified with the telegraph business, and retired from the management of the office in Hallowell about seven years ago, having been manager and operator for more than 45 years. His daughter was his first pupil, and was, it is said, the first woman to receive or send a message in the United States. His son is manager of the Western Union office at Portland, Me.

ELECTRIC LIGHTING.

According to a Chicago Record correspondent, the municipality of Carlruhe, Germany, is going into the electric-lighting business. It has been decided to erect an electric-light plant and waterworks, for both public and private use, at an estimated cost of 2,500,000 marks (\$595,000).

The Rochester Gas and Electric company held its annual meeting April 18th, at which officers were elected as follows: President, J. Lee Judson; first vice-president, William Runkle; second vice-president, Frederick Cook; treasurer, George Archer; attorney, A. H. Harris; secretary and assistant treasurer, W. L. Cole; directors, J. L. Judson, William Runkle, Frederick Cook, Walter S. Johnston, George Archer, H. G. Runkle, Harry L. Brewster, A. H. Harris, George C. Hollister, Granger A. Hollister, John N. Beckley, George A. Redman and W. L. Cole.

ELECTRIC RAILWAYS.

The New York, New Haven and Hartford Railroad company has undertaken the work of extending its third-rail system between Nantasket and Cohasset. The Nantasket Beach line has been a marked success and this has encouraged the company to apply the electrical equipment over a still greater extent of trackage.

It is now said to be possible to travel from New York to Boston entirely by trolley, with the exception of four small breaks. A recent trip took 49 hours and cost \$2.30 in fare—46 nickel fares. The distance by rail is 217 miles; by trolley it is one-third more, though the railroad fare is more than double what it costs to journey by the electric car. The longest continuous stretch of trolley road was from Boston to Worcester, Mass., a distance of 44 miles.

It is said that the Rochester (N. Y.) Railway company has passed under the control of the Cuyler-Morgan syndicate of New York. The deal, it is reported, was consummated by the syndicate buying up the stock owned by Sellers McKee of Pittsburg. The new owners of the road are said to contemplate the building of an electric line over the Ridge Road from Lockport to Rochester, a distance of 60 miles,

and the completion of the line from Rochester to Sodus Bay, another line of 38 miles.

The Chicago Tribune thinks that consolidation of all the Yerkes street-railway interests may be brought about under the charter of the Consolidated Traction company. There is a proposition now being considered to this end, it says, and the plan partially agreed upon is to consolidate the North and West Chicago street railroads with the lines in the Consolidated Traction company, taking in all of the surface lines on the North and West sides, and to issue bonds in place of the stock of the North and West Side companies.

The street-railway consolidation scheme which contemplates the absorption of half a dozen lines to the north of Boston, with the Lynn and Boston as the Boston terminal line, is progressing rapidly in its plans. If the promoters secure the Gloucester road, which they are after, the projectors will control every transportation line on the North Shore as far as Ipswich. Their next objective point is Haverhill, and thence to Newburyport, taking in the Haverhill, Merrimac and Amesbury and the Haverhill, Georgetown and Danvers companies, the latter having an extension to Rowley and Ipswich.

The Chicago City Railway company is considering the advisability of building an elevated loop from its Halsted or Root street line through the Union Stockyards to the center of "Packingtown." The idea originated with the big packers, and the street-car company has surveyed two routes for the proposed structure. The elevated structure, as proposed, is to carry a double track. Transfers are to be issued from the cars on this loop to all lines of the Chicago City railway. The Chicago Livestock Exchange favors the plan. The death of President Bowen has made it uncertain when the plan will be perfected.

ELECTRIC VEHICLES.

The International Automobile and Vehicle company has bought the tire factory of L. C. Chase & Co. of Boston and Chelsea and the Newton Rubber Works of Newton Upper Falls, where pneumatic tires are made.

The 10 per cent. paid in on the capital stock of the New England Electric Vehicle company, amounting to \$1,500,000, will be devoted to the construction of 600 electric vehicles for a starter and six power stations, it is stated.

It is announced that papers have been prepared for the incorporation of the Boston Auto-truck company, with capital of \$10,000,000, to engage in a general trucking business in Boston. As soon as this concern has been incorporated it is proposed to form the Massachusetts Auto-truck company, also capitalized at \$10,000,000.

The motor-carriage department of the Pope Manufacturing company of Hartford, Conn., has charge of the manufacture of the Columbia automobiles, and although it is generally known that business in this line has increased wonderfully within the last few months, the visitor is hardly prepared for the amount of machinery which a visit to this factory reveals. Mr. Goodrich, the manager of the Pope company's motor-carriage department, is much impressed by the extraordinary development of the business. He says that in this department 350 men are at work, in day and night shifts. The company is also erecting a new building, and when this addition is completed 200 additional hands will be employed. J. M. Hill, formerly of Chicago, is connected with the sales department for the Columbia automobiles in New York, and he is very enthusiastic over the actual business secured and the outlook for the future. He predicts a great development of the motor-carriage industry.

PUBLICATIONS.

The lighting transformers of the S. K. C. system are the subject of Bulletin No. 101 of the Western Electric company. The general features, regulation, efficiency and insulation of these transformers are described in a handsome eight-page circular. There are also observations on frequency, aging of iron and the use of oil. The illustrations in this bulletin are particularly fine.

The new price-list of N. I. R. rubber-covered and other insulated wires gives data for the different sizes, including the new standard requirements of insulation. The amendments to the National Wiring Code adopted at the recent meeting of insulated-wire men, electricians and fire underwriters in Chicago are given in the pamphlet, which is issued by the National India Rubber company of Bristol, R. I.

Dr. Franz Peters has compiled and the house of Arnold Bergstrasser of Stuttgart has published a manual of the "Progress of Applied Electro-chemistry and of the Acetylene Industry in the Year 1898." The volume contains 412 pages and 63 illustrations in the text and seems to have been prepared with German thoroughness. The development of the various electro-chemical arts is carefully indicated under appropriate headings, and there are indexes of subjects, names and patents.

On May 1st Charles H. Besly & Co.'s new 1899 catalogue will be ready for distribution, and will be sent free to any address on application. The firm

calls special attention to its revised list on all metals that will appear in this book. Furthermore, all lists have been corrected to agree with the present market. Among the new additions to the catalogue may be mentioned the Badger die stock set complete, Besly adjustable tap-wrench, new Brown & Sharpe tools, new Starrett's tools, laboratory specialties, Gardner grinders, Tanite grinding machines and emery wheels, Pecora machinery prints, Perfection and Bonanza oil cups and Helmet oil.

POWER TRANSMISSION.

The El Dorado Power company of San Francisco has been incorporated for the purpose of furnishing electrical power. The capital is \$150,000, and the directors are G. Lambert, H. O. Marvin, W. A. Bell and C. O. Richards of San Francisco.

The Spokane, Wash., Spokesman-Review says that the Washington Water Power company will make extensive improvements to its plant this spring. Work has been commenced. A new brick-and-stone power house will be erected; a new flume will be constructed, and two water wheels and two new dynamos of 1,000 horse power each will be installed.

A Stockton, Cal., dispatch says that the pole line of the Blue Lakes power plant is now completed from Stockton to Mokelumne Hill. It is expected that power equal to 5,000 horse power will be delivered in Stockton over four wires in 30 days. The survey for the line to Oakland is going forward rapidly. If the aluminum wires are entirely successful, the remainder of the great system will be completed in the same manner; if not the company will fall back on the copper wire.

The Tonawanda (N. Y.) Cataract Power company and the Tonawanda Lighting and Power company have been consolidated under the name of the Tonawanda Power company, and with these officers: President, Charles A. Sweet of Buffalo; vice-president, George Davenport of Boston; secretary-treasurer, DeLancey Rankine of Niagara Falls. The directors are C. A. Sweet, E. A. Wickes, William B. Rankine, DeLancey Rankine, C. B. Hill, G. W. Davenport, J. H. Rockwell and F. S. Smith.

B. N. Duke and Julian S. Carr of Durham, N. C., S. T. Morgan of Richmond, Va., and other capitalists have purchased the water power at Lockville Falls, near Lockville, N. C., together with several hundred acres of land adjoining. The purpose of the purchasers, it is said, is to develop thoroughly the 6,000 possible horse power available, erect an electric plant for transmitting the power, build a cotton factory and otherwise industrially promote the property. It is stated that several million dollars will be expended.

The Sacramento (Cal.) Electric, Gas and Railway company has made a contract with the Yuba Electric Power company for the exclusive use of 5,000 horse power for 30 years, the power to be delivered at the power house of the Sacramento company in Sacramento. The plant of the Yuba Electric company will be improved. The dam at the head of the flume will be very substantial. The power station is to be built entirely of stone, and designed so that its aggregate capacity can be brought up to 15,000 horse power. A reservoir will be located two miles back of the power station, which will have a capacity of 100,000,000 cubic feet. This will be connected with the forebay of the power station by two miles of pipe.

The Niagara Electric company of Niagara Falls has been awarded the contract for building a power house and dam for the new plant of the Albion Power company at Waterport, N. Y.; also for equipping the station, reconstructing the line, etc. The power house will contain two three-phase, 60-cycle generators, one of 100 kilowatts, the other of 150 kilowatts. Transformers will be installed to raise the current to 6,600 volts for transmission to Albion, a distance of seven miles, where the present power house of the company will be converted into a transformer station. It is understood that the conductors of the transmission line will be of bare aluminum instead of copper. A 75 horse power synchronous motor will also be placed in the Albion station. W. L. Adams will be in charge of the work. Wallace C. Johnson of Niagara Falls is the engineer of the Albion Power company.

A Toronto dispatch, dated March 31st, says: "In the Ontario Legislature to-day Premier Hardy took steps looking to a transfer to another corporation of the exclusive right to develop the water power on the Canadian side of the Niagara River. In 1892 the Canadian Niagara Falls Power company secured this monopoly, agreeing to pay \$25,000 a year for fifty years for it and to make certain improvements which were to be completed by November next. It has failed so far to make the required improvements, hence the movement to annul the monopoly. An American syndicate, in which ex-State Comptroller Roberts of New York and Mr. Belden of New York city are interested, is preparing to develop the power on the Canadian side of the river. It is said to have made arrangements with certain companies that intend to use 15,000 horse power to manufacture goods for sale in the British colonies."

TECHNICAL SCHOOLS.

The School of Civil Engineering at the New York University has expanded into a school of applied

science, with four distinct departments, a considerably increased income, and the prospect of suitable housing.

The annual catalogue of Purdue University of Lafayette, Ind., shows that 730 students are now attending this flourishing school, which is really Indiana's state institute of technology. The course in electrical engineering, in charge of Professor W. E. Goldsborough, is of four years' duration, practical and thorough. Particular attention is given to the designing of electrical machinery and appliances. A separate building is devoted to the departments of engineering and physics and is well equipped with machinery and apparatus. Purdue University is a state institution, and tuition is free to students who are residents of Indiana. Other persons desiring to attend are directed to apply to the president of the faculty. Moderate fees are charged to cover the actual cost of materials supplied in the various laboratories.

ELECTRICAL SECURITIES.

The Chicago Record notes that on account of the continued high prices of municipals and the consequent low net-interest return, there has been a broad market developed for bonds of electric-light companies in the large cities. A Chicago firm of bond brokers recently placed \$1,100,000 Cincinnati Edison gold fives at 106 1/4, and the recent issue of \$1,700,000 New Orleans Edison gold fives was oversubscribed, and the bonds are now selling at about seven per cent. premium. Judging from the market for Chicago Edison bonds, which have recently sold at 111, or a 3 1/2 per cent. basis, there ought to be a good demand for similar bonds from other cities. The Commonwealth (Chicago) gold fives, which were brought out last fall, are now said to be in good demand at a substantial premium. The electric-light business of Chicago is on such a substantial basis that investors seem to have considerable confidence in such securities.

Five per cent. 30-year gold bonds, to the extent of \$1,100,000, are being marketed by Chicago bankers for the Missouri Edison Electric company. They are part of a series of \$4,000,000 secured by blanket mortgage on the whole property. Mr. Samuel Insull, president of the Chicago Edison company, reported on the property as follows: "St. Louis is an extremely good electric-lighting city. The population is estimated at 600,000. It is compactly built. The people are substantial, and the tendency is to use electric light in both the business and residential districts. The company has the great advantage that its system reaches generally throughout the city, and also the fact that the climatic conditions are such that it is a very desirable thing to use an illuminant that does not throw off a great deal of heat. The property, as a whole, is a good one; the outlook for the business in the future is promising, and the company's earnings should show a steady increase from year to year."

FOREIGN ELECTRICAL NOTES.

The municipality of Teplitz, Bohemia, has called for bids for the establishment of a municipal electric works.

A hanging railway over the Seine will be one of the attractions of the Paris World's Exhibition. The railway will connect both banks of the Seine and be driven by electricity.

The Montan und Metallindustrie Zeitung of Vienna says that a stock company has been formed in Thorn, Germany, under the name of Electricitäts-werke Thorn with a capital of \$357,000.

Electric light has been put into the Vatican, and was used for the first time on February 20th. The total number of lamps is 6,000. The pope is reported to have said that "no one can say now that the Vatican is an enemy of enlightenment."

The palaces of the queen of England have all been provided with electric light. The queen long opposed this, but her Scotch palace at Balmoral and Buckingham Palace in London had installations put in last year, and Windsor palace was connected with the town station early this year.

A syndicate has been formed by the Mediterranean Electricity company (Thomson-Houston), the Societe Generale Belge d'Enterprises Electriques and the Societe Financiere des Transports d'Enterprises Industrielles, with \$600,000 capital, to furnish electric-motor street cars in Bologna, Italy.

A Cape Town newspaper says that "the demand for electric lighting in Cape Town appears to be considerably on the increase. We learn that one firm of contractors, Messrs. Bull & Sinclair, have secured the following large contracts, namely, Ronderbosch town hall, the new premises of the Cape Times, the permanent lighting of the opera house, the extension of Stuttford & Co. and Messrs. Duncan & Co.'s new premises in Adderley street. The work is being carried out by the firm's electrical manager, Mr. Morton."

"Preparations for the introduction of the electric light into Calcutta are going on apace," says the Calcutta Pioneer. "Mains are being laid, and the central station, where 1,500 horse power will be employed in generating the current, is approaching completion, though the whole of the apparatus has not yet arrived. Excellent accounts are being received

of the efficacy of the electric fan, the difficulty which first existed, of regulating the draft, having apparently been completely overcome by a simple arrangement for changing the angle of the blades of the fan, making it possible by doing little more than touching a button to produce anything from a 'norwester' to the gentlest of zephyrs. If this be the case, it will indeed be a boon to perspiring Calcutta in the rains, and may be expected to widely replace the coughing, slumbering punkah coolie. The engines, powerful as they are, which are being set up, will be entirely devoted to the production of the electric light and the driving of electric fans, a further installation being contemplated for the trams, when these come to be driven by electricity."

INDUSTRIAL COMBINATIONS.

It is said that plans are maturing for the consolidation of the several iron and steel interests. It is said that the capitalization of the consolidated company will exceed \$500,000,000.

The United Power Manufacturing company, with an authorized capital of \$12,500,000, was incorporated in Trenton, N. J., on April 20th. The company has for its purpose the merging of the Reading, Lebanon, Chestnut Hill and Roxborough electric railways, and to eventually connect Reading and Philadelphia by trolley. Richmond L. Jones of Reading is at the head of the corporation.

The gas and electric-light interests and all except one of the street railways of Washington, D. C., have been absorbed by a syndicate headed by Frederick C. Stevens. A deposit of \$250,000 has been made with the Fourth Street National Bank of Philadelphia to secure a consummation of the sale of the gas company. The gas deal involves an expenditure of about \$7,200,000, all of which the syndicate obligates itself to pay upon what are substantially cash terms. Including the gas deal, the holdings of the syndicate in Washington represent \$30,000,000.

A new electric-railway promoting company, which is to be called the American Railways company, and is to have an authorized capital of \$25,000,000, was incorporated in New Jersey on April 19th. The company is empowered to "build, construct and operate electric and other railways." The incorporators are Frank R. Hansell, George H. B. Martin and William S. Eidell, all of Camden, N. J. The real interests of the company are said to be represented by William F. Harrity, William H. Shelmardine, James J. Sullivan, Edward J. Matthews, Edward Lee, A. A. McLeod and Silas W. Pettit of Philadelphia. While the question of officials has not been definitely settled, it is said that A. A. McLeod will accept the presidency. The first assessment will give the company \$1,250,000 to begin business, and the remaining shares will be issued as occasion requires. The business of the company will be confined to the purchase and control of existing electric railways throughout the country.

MISCELLANEOUS.

A new plan for raising sunken cargoes of metal, such as steel rails, will shortly be tested in the Delaware Bay, if the Philadelphia Record tells the truth. A suitable crane boat will be equipped with dynamos and large electro-magnets incased in water-tight coverings, capable of lifting 4,000 pounds each. The magnets will be lowered to the sunken cargo from cranes and connected to the dynamos by flexible cables. They are expected to lift the submerged metal with ease. It is also claimed by the inventor that by letting magnets drag over the beds of channels valuable cargoes which have lain submerged for years can be located.

The Chicago Chronicle says that engineers and their engines are to be separated hereafter on the Chicago, Milwaukee and St. Paul and the Atchison, Topeka and Santa Fe railroads. All engines will be pooled and run continuously, regardless of the engineer in charge, instead of being run by one driver and lying up in the roundhouse while he sleeps. Since the time when railroading began engines have been assigned to particular men. But in the interest of business, traditions are to be thrown to the winds by the pooling plan. It is a fact not generally known that the railroad companies lose thousands of dollars every year by adhering to the custom of keeping one engineer to an engine.

The Vienna correspondent of the Chicago Record telegraphs that Vienna's new system of urban and suburban railways is now assured. The Official Gazette publishes the text of the concession from the minister of railways, Dr. von Wittek, to the Siemens & Halske company for the construction of a network of subways under the business center of the city, the lines which run in these subways rising to the surface in the less congested districts and changing from underground trolley to overhead trolley when the suburbs are reached. Vienna has now 30 metropolitan horse-car lines. In place of these, 60 urban and suburban electric tramways will be constructed, the work of transformation taking, it is expected, about five years.

The London Telegraph relates that at the Westminster County Court a claim was made for payment for making an electric table for a bear to dance on. The animal stood on the structure, the music played and an apparatus placed under the boards gave forth electric shocks which caused the bear

to dance. The claim was disputed on the ground that the current was not strong enough to make the animal dance sufficiently, but the electrician said that the defendant had told him that as bears had very tender feet, the shock required would not be so strong as that required to make a human being jump. Both he and the defendant were "shocked" on the table before the bear was put on it. The court gave judgment for the plaintiff.

TRADE NEWS.

The Aaron Electric company, 141 South Canal street, has taken the Chicago agency for the Eagle Electric Works of Peoria, Ill.

The American Electric Manufacturing company of Philadelphia has been incorporated in Delaware to manufacture all kinds of electric motors, engines, etc. The capital stock is \$1,000,000.

F. H. Whitman, Samuel H. Couch and E. B. Seeley have incorporated a company for the manufacture of electrical appliances in Boston. The capital is \$10,000. The name of the concern is the Couch & Seeley company.

Mr. J. H. Cooke, western representative for the Buckeye Electric company, gives notice that the office of his company will be moved from the present location to room 1537 Monadnock building, Chicago, on May 1st. He reports an excellent demand for the Buckeye incandescent lamp.

The Western Electric company is installing in Hillman's department store, Chicago, one 60 kilowatt and one 100 kilowatt 110-volt generator and a two-panel five-circuit switchboard. One hundred and twelve Petite arc lamps and 1,500 incandescent lamps will be used for the interior illumination of the store.

The Charles E. Gregory company of Chicago has found it necessary to enlarge its quarters, owing to the steady increase of its business, and has leased the building located at 54 and 56 South Clinton street, next door to its present location. The reputation of the Gregory company for ability to supply anything in the second-hand line is widely extended.

The Western Electric company of Chicago is making fire-alarm boxes, and has just secured an order for 50 keyless boxes from the city of Chicago. The price for each box is \$65. Other companies made these tenders for the same type of box: United States Fire and Police Telegraph company, Boston, \$90; Gamewell Fire-alarm Telegraph company, New York, \$135.

A Cleveland dispatch states that the National Carbon company has raised the wages of about 400 men employed in its West Madison avenue plant in that city. The advance ranges from five to 15 per cent. Prior to the announcement of the increase a strike was threatened. Some of the men are satisfied with the new scale and some are not. It is estimated that about 50 men dissatisfied with the new rate left the company's service upon the posting of the wage-scale.

Since the first of January, it is claimed that the foreign business of the General Electric company has increased more than 100 per cent. over the corresponding period last year. This branch alone, it is estimated, will aggregate \$4,000,000 for the current year. Last year the total business was at the rate of \$1,500,000 a month. So far this year it is at the rate of nearly \$2,000,000 a month. All departments at Schenectady are working night and day, and orders are said to be six months ahead of the capacity of the works.

The annual meeting of the stockholders of the Joseph Dixon Crucible company was held at the company's main office, Jersey City, N. J., on April 17th, and out of a possible vote of 7,345 shares there were 7,069 shares voted for the re-election of the old board, consisting of Edward F. C. Young, John A. Walker, Daniel T. Hoag, Richard Butler, William Murray, Alexander T. McGill and Joseph D. Bedle. President E. F. C. Young, Vice-president and Treasurer John A. Walker and Secretary George E. Long were re-elected by the directors. Judge Joseph D. Bedle was also re-elected as counsel.

BUSINESS.

The Garton-Daniels Electric company of Keokuk, Ia., reports a good business in Garton lightning arresters. It calls attention to a new railway type of pole arrester, mounted on a porcelain base and enclosed in a wooden box, which is fitted for attachment to a pole.

The Ball Engine company of Erie, Pa., has recently sold Ball engines for electric plants to the L. Wolff Manufacturing company of Chicago and the Jones Bros. Electric company of Cincinnati, and also for the Parlin & Orndorf building of Kansas City and Ayers & Son's store in Philadelphia.

J. G. Hickey, secretary of the Cutler-Hammer Manufacturing company, Chicago, states that the month of March was the best for business in the history of his company. The Cutler-Hammer company's well-known rheostats, controllers, etc., are in use in every civilized country, and they are giving the best of satisfaction.

The season for thunderstorms is at hand, and the Electric Appliance company is reminding the station manager that it is high time to look for lightning

protection. The company has prepared a complete catalogue of Garton lightning arresters, which it will be glad to send on application. The Garton lightning arrester has a long record of success, and is one of the best known lightning protectors on the market.

The Electric Machinery company has leased the premises at 135, 137 and 139 South Clinton street, Chicago, and will handle a complete line of dynamos, motors and arc lamps, both new and second-hand.

It will also make a specialty of rebuilding machinery. This company recently installed for the Slag and Gas company, Hammond, Ind., two 100-kilowatt, specially wound alternating-current generators, to be used in the manufacture of calcium carbide from slag.

The Western Electric company, in addition to its fan motors, is also building a complete line of power motors from 1-36 horse power up to 15 horse power in the encased and semi-encased open-type

style, and larger sizes in the open-type style. The same company directs attention to its large supply of Samson spot cord. This cord is especially adapted for the suspension of arc lamps, for use as bell ropes in cars and for trolley cord. Its smooth and pliable finish, combined with durability, lightness and strength, recommend it for many uses. A sample of this cord will be mailed to anyone in the business by applying to the Western Electric company.

ILLUSTRATED ELECTRICAL PATENT RECORD.

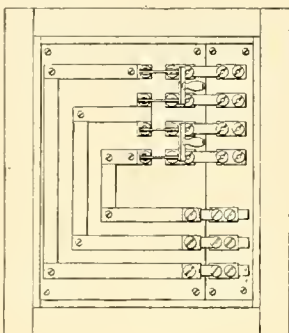
Issued April 18, 1899

623,136. Safety Cable System for Electric Railways. Harry B. Cox, New York, N. Y. Application filed February 12, 1898.

An important feature is an insulated grooved conduit having insulated conducting sections, with a continuous live conducting wire loosely and movably arranged in the conduit and without mechanical connections which would prevent its free movement.

623,141. Apparatus for Starting Electric Elevators. David H. Darrin, Cranford, N. J. Application filed August 1, 1898.

An auxiliary circuit is connected with the motor and an auxiliary switch controls the circuit. A rope leads to the car and is connected with the switch. When pulled the rope will close the switch and when released the switch will be allowed to open. A working circuit is connected with the motor, and means operated from the car for simultaneously shifting the belt of the motor to the tight pulley of the apparatus, releasing the brake and closing the working circuit.



NO. 623,172.

623,142. Electric Elevator Switch. David H. Darrin, Cranford, N. J. Application filed August 1, 1898.

In a switch the combination of a pivoted carrying blade and one or more straight contact jaws located within and at a tangent to the circle of movement of the blade, the end or ends of the jaws extending beyond the circle.

623,172. Junction Box. Thomas J. Murphy and Benjamin F. Neilson, New York, N. Y. Application filed December 9, 1898.

An improved junction box has a removable section carrying the conductors which connect the main circuit with one or more consumption circuits, terminals on the removable section, stationary terminals carried by the junction box and flexible safety fuses connecting the stationary terminals with the movable terminals.

623,195. Electric Accumulator. Alexis Werner, London, England. Application filed July 12, 1898.

In this accumulator the electrolyte consists of a solution of sulphates of magnesium, cadmium and of a zinc, with a positive formed of a metallic support on which alloy is electrochemically deposited from such solution and with a negative constituted of a leaden grid having covering fabrics of lead wire gauze burned to the grid and embedded in the active material on both faces on the grid.

623,223. Electric-railway System. Wilhelm Stein, Hamburg, Germany. Application filed October 3, 1898.

The combination with a plurality of controllers is described of a plurality of constantly running motors, each controller being associated with a motor, and means for simultaneously engaging the motors with and disengaging them from the controllers.

623,242. Means or Apparatus for Producing and Exhibiting Animated or Changing Pictures on Advertising Appliances, etc. William Friese-Greene, London, England. Application filed July 7, 1898.

A hat having a body of translucent material in combination with a cylindrical picture-bearing sheet within the body, a cylinder concentric with the cylindrical picture-bearing sheet situated between it and the hat body, and having equidistant openings around it, a lighting device in the hat body, and means for simultaneously imparting rotation in reversed directions respectively to the picture-bearing sheet and the cylinder.

623,275. Electric Letter for Signs. Charles A. Chauncey, Chicago, Ill. Application filed April 8, 1898.

A letter for signs and the like, comprising a face provided with a series of spaced openings arranged to form the letter desired, a casing connected with the face, a back attached to the casing, and a series of electric-light sockets between the face and the back, the ends of the sockets projecting into the openings in the face, the back and face engaging the sockets so as to hold them in position without the aid of other holding devices.

279. Arc Lamp. Thomas E. Drohan, Chicago, Ill. Application filed August 8, 1898.

The arc lamp described has a clutch mechanism serving to support the upper carbon, a clutch-releasing device pivotally mounted in the lamp, the device having a part normally engaging the carbon, whereby the arms are held in position to release the clutch mechanism, the device being adapted to swing out of its releasing position and support the carbon in its final position within the clutch when a predetermined portion has been consumed.

623,203. Electrically Connected Printing Machine. Christopher A. Shea, Milton, and John J. O'Lalor, Medford, Mass. Application filed April 20, 1896.

The system of electrically connected printing machines includes a mechanical typewriter containing a mechanism which is moved from a determinate position one definite distance farther by the depression of each succeeding key of the machine, and which is restored to a determinate position upon the release of the key, a series of contacts over and upon which the mechanism passes, a source of electricity and a live wire.

623,316. Induction Apparatus. Thomas B. Kinraide, Boston, Mass. Application filed May 5, 1898.

A magnetic core and a coil adjacent thereto are essential features, the core presenting curved surfaces adjacent the coil, curving therefrom in a direction away from the coil, whereby the lines of magnetic force leaving the core perpendicular to the surfaces are widely distributed about the coil.

623,317. Electrical Break. Thomas B. Kinraide, Boston, Mass. Original application filed May 5, 1898. Divided, and this application filed September 24, 1898.

An electric break comprises an arm carrying a hammer, an anvil opposite the hammer, the arm being yieldingly supported and provided with means for regulating the tension or resistance thereof, an interrupter for engaging the free end of the arm, and automatic means operated by the current being broken for driving the interrupter.

623,318. Electrical Spark Gap. Thomas B. Kinraide, Boston, Mass. Application filed September 24, 1898.

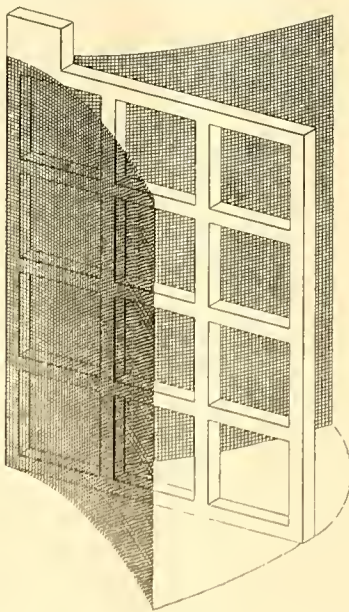
A spark gap of the kind described for use in a condenser circuit presents opposite parallel discharge surfaces of relatively large areas and means for regulating the discharge distance between the parallel surfaces, whereby a condenser charge may be automatically governed.

623,329. Electric Arc Lamp. Adolphe Mougin, Paris, France. Application filed October 21, 1898.

In an electric arc lamp there is the combination of a pivoted frame, clock mechanism supported thereby, the same comprising a spring barrel provided with an arbor, a ratchet wheel on the arbor of the barrel, a train of gears operated from the arbor and a pawl pivoted on one of the gears and taking into the ratchet wheel, and a pinion on the arbor, with a starting electro-magnet, an armature carried by the pivoted frame and adapted to be attracted by the electro-magnet, an endless chain passing over the pinion, carbon holders operated by the chain, and a brake acting on the train of gears and suitably operated from a derived circuit.

623,352. Duplex Switch for Telephones. George C. Buell, Boston, Mass. Application filed August 15, 1898.

A two-part switch lever for telephone apparatus, one part of which is movable independently of the other in one position of the latter, and moved and controlled by the movement of the latter, and means as springs normally tending to move the two parts in opposition to each other.



NO. 623,195

623,363. Electric-light Hanger. William Gerth and Frederick Peters, Newark, N. J. Application filed October 13, 1898.

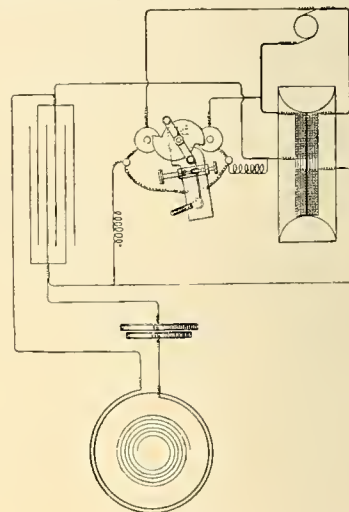
An electric-light hanger, comprising a hanger box having on two opposite interior walls similarly disposed integral curved ribs each approximately semi-circular with an extension on the convex side, a pulley arranged vertically above the ribs, a single supporting rope passing over the pulley, and a suspending link attached to the rope and having an approximately spherical enlargement of a diam-

ter greater than the distance between the ribs and a shank small enough to pass therebetween, the lower end of the link being perforated for attaching a lamp.

623,383. Motor-vehicle. Francis A. Pocock, Philadelphia, Pa. Application filed April 13, 1898.

In a vehicle the combination with the body and the rear running gear of the front running gear pivotally connected to the vehicle whereby it can be used for steering, the electric motor below the vehicle body, and movable vertically relative to the running gear, and power-transmitting devices for connecting the motor to the front wheels.

623,393. Electric Current Controller. James B. Breeding, San Antonio, Texas. Application filed August 13, 1898.



NO. 623,316.

An electric-current controller, comprising a number of resistance blocks arranged in the form of a cylinder and connected in series, caps of insulating material between which the blocks are arranged, a rod extended longitudinally through the blocks but insulated therefrom and forming a portion of an electric conductor, a contact carried by one of the caps and adapted for electrical connection with the blocks and a conductor leading directly from one of the blocks.

623,433. Electric Fan. Samuel L. Shellenberger, South McAlester, Indian Territory. Application filed April 21, 1898.

Claim is made for the combination of a support, a sleeve, a central shaft, rotatable in the sleeve, a motor having a rotary fan, a frame for the fan, having a ring or band provided with face brackets, and the blades extending across the face of the fan and secured to the face brackets.

623,437. Telephone-switchboard Circuit. Edwin H. Smythe, Freeport, Ill. Application filed February 23, 1898.

The switch-plug and cord-circuit connection comprises two terminal switch plugs, each having two main contact surfaces adapted to engage spring-jack contacts, two inductively continuous but conductively discontinuous main-lead conductors extending respectively between the corresponding contacts of the plugs, and a disconnecting signal device for each of the conductively divided cord-circuit sections, bridged between the two strand conductors of its own section.

623,441. Automatic Fire and Burglar Alarm. Henry E. Thompson, Cameron, N. C. Application filed April 16, 1898.

A main-line conductor is normally energized by the battery. Electric alarms are included in circuit with the conductor and the battery. Fusible conductors are in circuits that are short to the alarms. An office alarm is controlled and operative by the breaking of any of the fuses. A second battery is provided and means for manually introducing it into the circuit of the other battery.

623,444. Electric-railway Signaling Device. Daniel Valentine, Brockton, Mass. Application filed September 23, 1898.

Features of this invention are: Movable rail contacts or switches, a source of electrical energy or line feed, solenoids, semaphores or signals, solenoid bars within the solenoids and operatively connected to the semaphores, springs for actuating the bars in opposition to the solenoids, automatic locking devices for the semaphores, solenoids for releasing the locking devices, and circuit-closers actuated by the bars for automatically conducting the current from one of the solenoids to the other one in the system.

623,480. Electric Cigar Lighter. William F. Kessler, Auburn, Ind. Application filed October 17, 1898.

An electric cigar-lighter consists of a horizontally arranged containing case or shell pivotally mounted in or from a proper support, and provided with a suitable opening in its upper face for the purpose specified, a pendant wick tube and oil reservoir fixed in the shell, a hand lever pivotally fulcrumed on the reservoir carrying an extinguishing cap upon its inner end in co-operative relation with the burner of the wick tube, and provided with a pivoted sparking device adapted to throw the ignition spark within the shell, and means for normally securing the lever in position.

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No. 18

Great Northern Electrical Plant.

The Great Northern buildings on Jackson, Dearborn and Quincy streets in Chicago consist of five connected and adjoining structures bearing a common name and conducted, in a general way, under one management. These are the Great Northern Hotel, on Dearborn street; the Annex to the hotel, on Quincy street; the Great Northern baths, also on Quincy street; the Great Northern office building, on Jackson street, and the Great Northern Theater, between the office building and the Annex and with entrances from both Jackson and Quincy streets. The picture (Fig. 5, page 252) shows the older portion of the hotel and the office building, the frontages being on Dearborn and Jackson streets. The buildings are erected about a central court over the theater. With the exception of the bath-house they range from 14 to 18 stories in height, the latter on the interior court, where a palm garden on the Annex and a roof garden on the office building add to the height. The street frontages are: Jackson street, 200 feet; Dearborn street, 167 feet; Quincy street, 225 feet. In the hotel establishment there are three kitchens, five large dining-rooms and a large number of rooms for private dinner parties, seven bar-rooms and 618 sleeping rooms.

A lavish use of electric light is made in the Great Northern buildings, both for general illumination and for advertising and embellishment. All told, the buildings are wired for 18,000 incandescent lights, mainly of 16 candle power each, as well as 34 low-tension arcs and 46 horse power in electric motors. Formerly the load was carried on central-station mains, but within the last few weeks a private plant has been put in operation, and this installation now furnishes about all the current needed for light and power. Owing to the character of the buildings supplied, only a comparatively small proportion of the lights connected are apt to be thrown on the machines at one time. The large office building, for instance, is practically deserted before the demand for theater lighting commences. Thus, the generating plant installed is only about half that which would be required to operate all the lamps and motors at once.

The new steam and electric plant is on the Quincy street side of the buildings, in the basement. Steam is raised in three boilers of the Scotch marine type (Fig. 2), each 92 inches in diameter and 20 feet long and rated at about 250 horse power. Each boiler is equipped with two Morrison suspension-flue furnaces and has 92 three-inch flues. An ordinary quality of soft coal is burned for fuel. Draft is obtained by a 250-foot stack, all in the building except about 30 feet, which projects above the roof. These boilers supply steam at 150 pounds initial pressure for the dynamo engines, some of the elevator pumps and kitchens and the Great Northern baths. They are provided with a four-inch covering of magno-bestos block. The Scotch type of boilers is not often seen in isolated plants in the West, but these provide a large amount of power in comparatively small space. They were built by the Phoenix Iron Works company of Meadville, Pa.

Exhaust steam is used for heating. The Irving steam-loop system is installed, and all drains are automatically returned to the boilers. The boiler and house pumps were built by the Laidlaw-Dunn-Gordon company of Cincinnati, and are of the tandem-compound type. There are 12 hydraulic elevators in the buildings and four elevator pumping engines—one Crane, one Worthington and two Dean. The elevators in the newer buildings are operated at a water pressure of 250 pounds to the square inch; those in the older portion of the hotel at 85 pounds to the inch.

On the Jackson street front of the buildings there is another and older steam plant, quite distinct from

the one illustrated and having no connection with the electrical plant. It consists of tubular boilers of 320 horse power, supplying steam to elevator pumps, house pumps, laundry machines, steam power fans, kitchens and numerous small engines and air compressors. The exhaust from this plant is also used for heating. It is interesting to note that in all the buildings there is no less than 124,000 square feet of radiating surface in 2,500 radiators. The combined capacity of the steam-generating plants is 1,070 horse power.

Three engine-dynamo units supply the electric current consumed in the building. They are placed under the pavement of Quincy street, the excavated space extending to the center line of the street. They are illustrated in Fig. 1, and, as the picture shows, they are very compactly fitted into the space assigned to them. Ball cross-compound, horizontal, non-condensing engines of 250 horse power each are directly coupled to 150-kilowatt Western Electric multipolar generators, wound for 115 volts.

Front and rear views of the marble switchboard are shown in Figs. 3 and 4. The board is fitted with Weston instruments and switches of the latest type. The distribution system of the buildings is on the three-wire Edison system, but the machines are con-

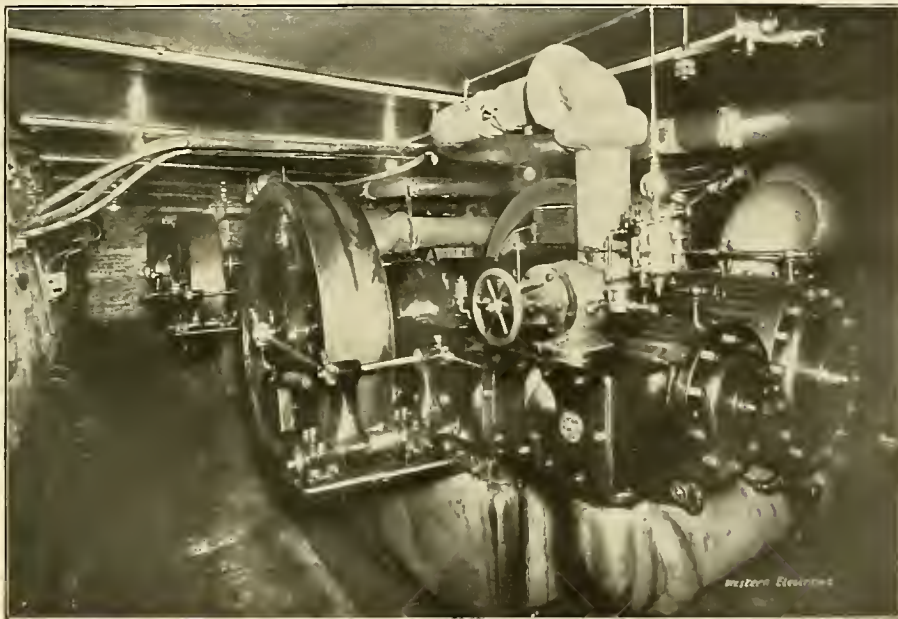


FIG. 1. GREAT NORTHERN ELECTRICAL PLANT.—ENGINE-DYNAMOS.

nected to the board by the ordinary two-wire leads. The transformation is effected on the back of the board and not at the centers of the wiring distribution, as is sometimes the case.

The total number of arc and incandescent lights has been already given. It may be mentioned that there are about 1,800 incandescent lamps of 10 candle power each in theater and hotel signs alone. In the hotel there are a number of large oil paintings, and over 360 lamps are studded in the frames of these pictures to obtain special illuminating effects. There are 10 electric motors, ranging from three to eight horse power each, used to drive ventilating fans and for the machine shop connected with the plant, a dishwashing machine, the organ pump in the hotel lobby and the fountain pump and water systems of the palm garden on the eighteenth floor of the Annex. The heaviest load on the plant comes about 9 p. m., and the maximum so far recorded is about 2,400 amperes.

Mr. Alexander Davidson, one of the principal owners of the Great Northern property, has taken a great interest in the new plant, which was installed largely through his efforts. F. W. Cole is the chief engineer.

It is asserted that an Austrian engineer named Pollak has made a discovery rendering it possible to telegraph 1,000 words a minute over a single wire. But a Washington dispatch says that the synchrograph of Squier and Crehore was tested in General Greely's office in the War Department last month and that a speed of 2,000 words a minute was attained.

\$10,000 Damages for an X-ray Burn.

In September, 1895, Frank V. Balling of Blue Island, Ill., was thrown from a buggy and the bones of his ankle were dislocated and broken. He is a large, stout man, and the doctors were unable to diagnose the injury with sufficient accuracy to effect a cure. A year later, on September 19, 1896, acting on medical suggestion, Mr. Balling went to the Röntgen X-ray laboratory in Chicago managed by Mr. W. C. Fuchs to secure a skiagraph of the damaged joint. This was but a few months after the first experiments in this country with the X-ray, and practitioners were still in large measure ignorant of the best and safest manner to handle the radiation when permeating human tissues. As shown by sworn testimony later, three exposures were made, varying in duration from 30 to 45 minutes each, and the Crookes tube was but six inches from the skin of the foot. At the present time, in the same laboratory, no exposure of over three minutes is made, and the tube is placed 12 or 15 inches from the flesh. Mr. Balling swore that at the time of the long exposures to the X-ray he experienced a tingling sensation. A few hours afterward the skin became discolored over the exposed surface and blisters formed. Then, according to

testimony, the deeper tissues showed that they were affected; the flesh decomposed and sloughed away. Later there were two amputations to remove the dead bone and tissue—one at the ankle, and later at a point five inches below the knee. After the last amputation Mr. Balling recovered.

Through his attorneys, Stirlen & Dickson, Mr. Balling brought suit against Dr. Otto L. Schmidt, principal proprietor, and W. C. Fuchs, manager, of the X-ray laboratory, for \$25,000 damages for the injuries that he claimed to have sustained as the result of the improper use of the X-ray. The case was tried from April 17th to April 27th, before Judge Chetlain and a jury. It was bitterly contested and turned largely on the expert testimony of scientific men and physicians, which was entirely contradictory. The X-ray expert for the plaintiff was Professor H. P. Pratt, while Dr. John P. Webster, Dr. Bacon, Dr. Robert L. James and Dr. Evans gave evidence on that side as physicians.

For the defense it was claimed that the serious injury to the deeper tissues did not result from the X-ray burn on the skin, if there was one, and that the plaintiff had had the benefit of the latest knowledge in the art at the time he applied to have the skiagraphs made. The X-ray experts who testified for the defendants were Professor Wilbur M. Stone of Swarthmore College, Philadelphia, formerly of Armour Institute, Chicago; Truman P. Gaylord of the Chicago Edison company, formerly of Armour Institute; Samuel G. McMeen, chief engineer of the Central Union Telephone company, Chicago, and Professor Launcelot W. Andrews of the Iowa State University. The physicians called for the defense were Dr. A. Church, Dr. James Burry, Dr. A. D. Bevan and Dr. L. L. McArthur, all of Chicago.

But the jury accepted the plaintiff's side of the case and brought in a verdict against the defendants for \$10,000 damages. A motion for a new trial was made, and the defendants say that they will fight the case to the court of last resort, if necessary.

This is one of the first X-ray damage suits to be tried in this country. In the amount of damages awarded, length of trial and vigor of contest it is undoubtedly the most important. The trial attracted much attention.

Reports of the combination and sale of the North and West Chicago street-railway systems to various eastern groups of capitalists have been circulated in New York and Chicago; but nothing definite seems to have been thus far accomplished.

Arc-lamp Department of Central-station Business.

By H. W. HILLMAN.

There is no one branch of greater importance to the central-station business to-day than the arc-lamp department. While many of the larger central stations have realized the need for such a department and appreciated its importance, the majority of the electric-lighting companies throughout the country

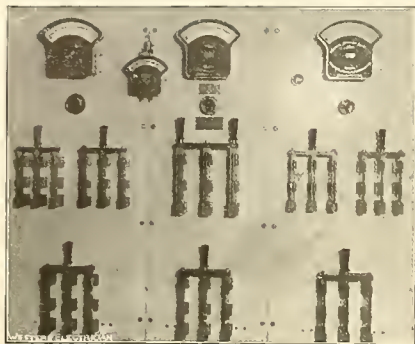


FIG. 3. GREAT NORTHERN ELECTRICAL PLANT.—SWITCH-BOARD.

have not as yet given this subject the attention it deserves.

To create and maintain a successful arc-lamp department, one of the most essential requirements is to secure the services of some bright, active solicitor, well posted on the subject of modern arc lamps, the cost of operating, arguments in their favor, as well as against other forms of artificial light. Often the lighting company has some energetic man, either in its office or station, who can be educated to take up this work to the advantage of the company and great assistance to the central-station manager. In other cases the managers are able to devote considerable personal attention to the matter of soliciting. There are many lighting companies, however, which are suffering in this respect, for the reason that the manager is not only too busy to devote much time to the arc-lamp business, but has not as yet considered it sufficiently important to place a man on this particular work.

Some of the prominent subjects with which the solicitor should be familiar, in order to make a good showing for the arc-lamp department, are as follows:

- The relation of the central station to the merchant.
- Adaptability of electric arcs to store illumination.
- Familiarity with modern methods of illumination, also candle-power ratings.
- Importance of careful installation.
- Specialties in arc lighting; low current, lamps, etc.



FIG. 2. GREAT NORTHERN ELECTRICAL PLANT.—SCOTCH BOILERS.

central station and the merchant should be very close. There is an extensive demand among the merchants for the very best light obtainable, and the solicitor who keeps in touch with this demand, studying carefully the needs of the merchants in every way, is of invaluable assistance to the station manager. Such practice is conducive to a prosperous business and the use of light in great abundance.

Where central stations have not as yet introduced the modern interior arcs among their merchants, it is the duty of the solicitor to study the situation carefully. Do not "beat around the bush" and attempt to temporarily discredit new lamps which some energetic merchant of your town has seen when visiting New York.

Urge your superintendent or manager to favor the most important customers you have, introducing the new arcs gradually and after careful consideration. The electric-lighting company should lead and the merchant follow, in the adoption of a first-class light. Create the pleasantest relations with your merchants and maintain them strictly. By so doing, your commercial circuits will always afford you handsome returns.

ADAPTABILITY OF ELECTRIC ARCS FOR STORE ILLUMINATION.

Artificial light was never known to have been used so freely in the commercial world as at the present

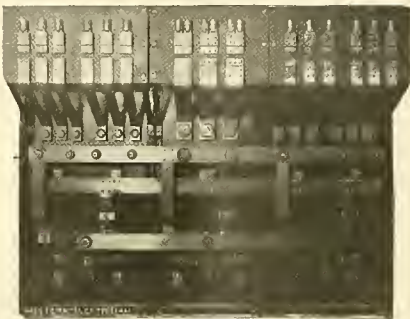


FIG. 4. GREAT NORTHERN ELECTRICAL PLANT —SWITCH-BOARD, REAR VIEW.

time, and the adoption of arc lamps for interior illumination has encouraged this new lighting era. There never was a period in the history of the electrical industry when the central station was enabled to furnish to the merchants so suitable and attractive a lamp—a light pleasing to the eye, perfectly suited to the display of all classes of material, quick to illuminate and easy to extinguish; its design chosen with care that its size and appearance might harmonize with the surroundings common to the modern department store. Evidence is not lacking to demonstrate the perfect satisfaction with which this form of light has met among merchants. The rapid-

25,000, has between 200 and 300 lamps in use among its merchants. The close relationship between the central station and the merchant as well as the perfect adaptability of the interior arcs for store lighting partially account for these remarkable results.

FAMILIARITY WITH MODERN METHODS OF ILLUMINATION, ALSO CANDLE POWER RATINGS.

As there are a great many classes, styles and finishes which go to make up the full line of lamps for alternating and direct-current circuits, it becomes somewhat of a study to know what to recommend, when submitting propositions for lighting a department store. In the old days, when the ordinary series arcs were used, the amount of light produced depended upon the current of the machine. In one town 6.6-ampere arcs furnished the stores with a certain volume of light, while the adjoining city stores were favored with 10-ampere lamps of greater illuminating capacity. The size, dimensions and adornment of the lamps were likewise unsuited to the commercial needs. To-day, however, the solicitor is favored with the most artistic shapes and fancy designs. Great long lamps have been replaced by those of short and attractive size. It is the pleasure of the merchant to highly commend the lamp design as well as the character of the light.

Opportunities are afforded for skillful arrangement in the matter of installation. Fig. 1 shows the single-globe style of lamp, which is most popular for many classes of business, whereas the double-globe type can be highly recommended for certain work, especially in the display of materials exhibited among the various departments in dry-goods stores. Merchants will highly appreciate the extra time spent by the solicitor in studying his requirements for light and the earnest efforts put forth to furnish the most modern and up-to-date lamps known to the trade. Let the lighting companies all over the coun-

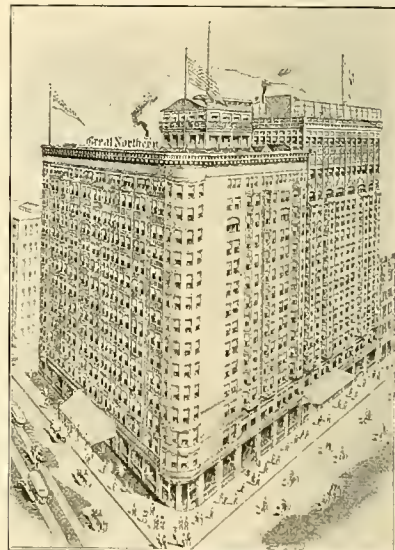


FIG. 5. GREAT NORTHERN BUILDINGS.

try advertise these points, for they are strong arguments. The lighting industry of the world has been revolutionized, and the arc-lamp department has now become one of the most prosperous branches of the central-station business.

Merchants frequently ask, "What is the candle power of your lamp?" and are greatly confused upon being advised that it is 1,200 or 2,000 candles; in fact, the solicitor and station manager likewise meet with considerable difficulty in touching upon this subject. Reference to a 1,200 or 2,000 candle power rating means but very little to a merchant. A much easier, clearer and more satisfactory method is to refer to the number of square feet of surface which can be satisfactorily lighted by each arc lamp. As an illustration, a room is fitted containing 2,800 square feet, well lighted by four alternating, six-ampere lamps, each lamp lighting an area of 700 square feet. The lamps are suspended eight feet from the floor.

This method has been practiced by many solicitors to advantage. As to the meaning of the term satisfactory illumination, it has been stated that what might be considered satisfaction by one merchant would not be acceptable to another. This point can easily be settled by selecting a representative store and installing lamps according to this method of rating. The solicitor can then refer to this installation, and induce prospective customers to investigate the satisfaction as experienced by the proprietors themselves.

This rating, of course, would not apply where materials such as draperies and curtains are supported from the ceiling, tending to obstruct the light and detract from its best distribution. In such places a lamp of less illuminating capacity should be installed and a greater number of lamps furnished. A solicitor, well posted on the subject of light distribution and best methods of illumination, will command the respect of the store proprietor, greatly increase the efficiency of the arc-lamp branch of the

Thorough knowledge of arguments against Welsbach burners.
Maintenance expense, quality of light and cleaning of inner globes.

RELATION OF CENTRAL STATION TO MERCHANT.

The solicitor is the backbone of the arc-lamp business. Upon his attitude toward the merchants depends to a great extent the increase of customers on the commercial circuits.

It is of vital importance that the relation of the

ity with which central stations have introduced the lamps is indicative that the light is pleasing, and the business mutually satisfactory. In a city of medium size in New York state 400 alternating enclosed arcs were installed during a period of from six to eight months. A central station in Ohio introduced 300 direct-current enclosed lamps in the short space of 90 days. A large plant in the South has placed on its circuits in excess of 1,000 alternating lamps since the spring of '98, while an aggressive station in Michigan, operating in a city of only about

lighting company, and reduce to a minimum the number of complaints due to poor artificial lighting.

IMPORTANCE OF CAREFUL INSTALLATION.

The good results accruing from the exercise of special care in the installation of lamps fully warrant giving special attention to this point. In this connection a wide-awake solicitor will interest himself in the matter when the installation is being made, by inspecting the lamps thoroughly before being satisfied that they are right. His duty is not ended simply because he has secured a new customer, for if the lamps give trouble then the merchant expects the solicitor to see that they are made satisfactory. A close co-operation between the solicitor and the arc-lamp testing man at the station will produce excellent results and obviate trouble before it exists.

Infrequently it happens that trouble commences when the lamps are being placed on the circuits. One case is cited where lamps were recently installed in a large clothing store, without a switch to throw the lights on and off, either collectively or individually. It was arranged that they should be lighted by using a long stick to strike the switch attached to the top of each lamp. As distinct from this method, Fig 2 shows a modern arrangement in the form of an incandescent-lamp cord, suspended from the arc lamp, attached to which is a push-button switch. This furnishes a most convenient arrangement, and at the same time is inexpensive to install. Another point essential to satisfactory service is to inspect the frequency and voltage connections before installing. The frequency of the circuit is of course known, but the lamp may be connected wrong when received from the manufacturer, and by testing at the station the matter is given attention and trouble

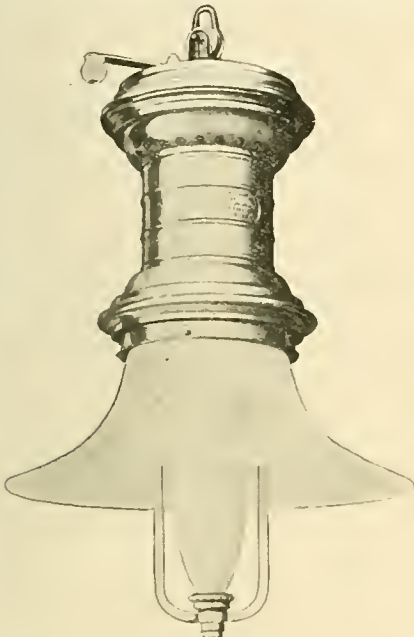


Fig. 1.

money; the low-current arcs do not give a sufficient volume of light, and, finally, it results in throwing out electricity for gas, or else a compromise in the price of current. There are 750 three-ampere lamps used for interior lighting in the city of Hartford, Conn., with satisfaction to the merchants as well as the central-station management. A solicitor can secure or lose business in proportion to the amount of study and time devoted to modern methods of interior lighting.

ARGUMENTS AGAINST WELSBACH BURNERS.

Where competition is keen, the price of gas low and a good solicitor employed by the gas company, it requires energetic work and effective arguments to increase the number of arcs in service, or even to hold business already secured. One very good way of creating a stir in the matter of lighting is to equip the windows of some representative store with a first-class arrangement of lighting, installing the arc lamp so that the source of light is not shown, but that the material on exhibit is displayed to perfection, as in Fig. 3. Then select some window lighted by Welsbachs for comparison (Fig. 4). The argument seems conclusive that a merchant having considered it sufficiently important to light his windows for evening advertisement can well afford to have the best light obtainable.

These photographs were taken by the artificial light from the lamps at nine o'clock in the evening, each having had the same time exposure. By introducing lamps in the front of the store the light is called so forcibly to the attention of the store proprietor that not infrequently it is an entering wedge toward displacing gas throughout the entire store; especially is this true where colors have been accurately matched



Fig. 2.

ARC-LAMP DEPARTMENT OF CENTRAL-STATION BUSINESS.

beneath the rays of the electric arc. There are many arguments against the use of Welsbachs for commercial work which are within easy access of solicitors earnestly anxious to learn all their weak points. One of the most annoying and dangerous as well as expensive features seems to be that of "burning off the wax" from the new mantles. Coupled with the use of matches for igniting the gas, and compared with the enclosed arc, so conveniently lighted, there would appear to be no reason why Welsbachs should be used for commercial lighting.

MAINTENANCE EXPENSE, QUALITY OF LIGHT AND CLEANING OF INNER GLOBES.

There is no one thing which is of greater benefit to central-station lighting business than the maintenance of a high grade and character of light. It is this superiority which first attracted business men to the modern arc lamp, and the maintenance of its high quality of light will cause a continued satisfaction among the mercantile trade. All forms of artificial light which have heretofore developed a commercial success have required maintaining at more or less expense and annoyance. When, in the old days, oil lamps were common among the business houses, lamp chimneys were generally cleaned by the "boy" in connection with other duties, such as cleaning of windows, sweeping the store, etc. Welsbach mantles are either removed by the gas company's employes, at the expense of the merchant, or some employe of the store is given this duty. As a result neither the chimneys nor the mantles are cleaned regularly; in fact, negligence and lack of care in connection with renewal of Welsbach mantles is so well known that it has effected great injury to the gas business. The uniform character of light, the poor distribution and the dissatisfaction on account of inattention to mantle renewals are all contributing to the gradual displacement of gas for mercantile lighting.

The central station has a remarkably strong ar-

gument, therefore, in respect to the care and attendance of arc lamps. The merchant is required to give no attention whatever to the matter of light. He is assured that its quality cannot deteriorate, for the station attendant visits each store frequently and regularly for the purpose of either changing globes or renewing carbons. The care exercised in this matter insures a uniform light continually.

While the foregoing deals particularly with suggestions to solicitors, there are many subjects relating to the arc-lamp department which demand the personal attention of the central-station management.

It is safe to assume that these subjects have not had the attention of all station managers, and as arc lamps were never more popular than at the present moment, it seems a fitting time to consider thoroughly this important subject.

PROFITABLE YET POPULAR RATE OF CHARGE SHOULD BE ENCOURAGED.

Wherever central stations have been most successful in introducing interior arc lamps, the most careful consideration has been given to the cost of operating, the selling price for current and the profits under various conditions of operation. Not only is a central station bound to furnish an appropriate illuminant, but the price for current must be within the reach of the smaller merchants as well as encouraging the extensive use of light among the largest customers on the service. It is surprising how easy the clerks in a store acquire the habit of throwing on the lights at any hour of the day in order to more effectually illuminate their counters. Where the price of current is high, the clerks are severely criticized for the liberal use of light, and are given to understand that the greatest economy must be



Fig. 3.



Fig. 4.

remedied at your own door. It is much more businesslike to ascertain and know the line voltage at the point of installation, carefully adjusting each lamp before installing, for the proper length of arc. While these points may seem so simple as not to require mention, yet it is certainly a common thing among the stores to see lamps operating at too high or too low an arc voltage, necessitating adjustment and altering at the customer's place of business. To obviate these troubles establish a testing rack at the station, have it understood that some one man is responsible for the lamps sent out and that each lamp is thoroughly tested before installation.

SPECIALTIES IN ARC LIGHTING, LOW-CURRENT LAMPS, ETC.

Opportunities are afforded for meeting competition against other forms of lighting by the use of lamps of low energy consumption. For example, a four-ampere, alternating, enclosed arc, consuming but 300 watts at its terminals, is attractive to the merchant by reason of its low cost of operating. By using the single-globe type of lamp the volume of light is of a very respectable amount, and offers a first-class illuminant at small expense to the customer. The same holds true of the 3/4-ampere lamp for direct-current circuits, consuming about 360 watts on a 110-volt line. Here is another instance where it is of importance that the solicitor should study the matter of installation and exercise good judgment as to when and where to use a low or high-current lamp. The manager of the station is generally too busy to go into details and must rely entirely upon the efforts of the solicitor to please a customer. The writer is familiar with a case not long ago where three-ampere lamps were installed alongside of and to replace lamps of much higher current. The trial was a failure, and the station manager received the idea that he could not use the low-current lamp. Such cases are not uncommon. The merchant feels that the high-current lamps are costing too much

exercised. On the contrary, a reasonably low rate for all customers, and special rates for large and long-hour customers, educate them to use light more liberally; and as good light tends to increase sales, the clerks favor its use.

Where rates are high the inevitable result follows, namely, the loss of business and the introduction of Welsbach burners. To regain this trade and conduct an energetic campaign against gas consider the subject of rates carefully. It will be found that while even a slight reduction in rates will decrease the profits, figuring on the same amount of business, yet the amount of business increases rapidly when dealing with arc lamps consuming nearly a half kilowatt per lamp. It may be interesting to know that 100 direct-current lamps operating an average of only four hours daily afford a gross annual income of \$7,920 at a rate of 12 cents per kilowatt-hour. Considerable experience and investigation on this point of increased business shows that about 200 commercial arcs can be introduced in cities as large as 20,000 to 30,000 population, favored with two or possibly three dry-goods stores. In other words, a business is created of approximately \$16,000 annually, offering satisfaction to merchants and driving out of commercial use from 800 to 1,000 Welsbach burners. I have not attempted to couple with this proposition the benefits to the incandescent, power and fan-motor branches of the business, which, if figured out on the same basis, would demonstrate that while the same percentage of profit cannot be reasonably expected after reducing rates, yet a lower percentage figured on an increased gross amount will produce equal, if not increased, profits in dollars and cents.

SHOULD CENTRAL STATIONS PURCHASE LAMPS AND FURNISH THEM FREE TO MERCHANTS?

As a business proposition there seems to be excellent reason why the central station should furnish lamps free. On the basis of 100 lamps an investment would be required of approximately \$2,000. At six

and 10 per cent. respectively, the annual interest and depreciation account would amount to \$320. The gross annual income from 100 lamps, operating a daily average of four hours, would be \$7,920, figuring at a rate of 12 cents per kilowatt-hour. At a fair percentage of profit, the net income is sufficient to more than warrant the small investment referred to. Aside from a financial standpoint, there are many objections to the merchants purchasing the lamps. Circuits are apt to be filled with various forms of lamps; different makes and sizes of carbons and globes must be carried in stock. Central stations must keep on hand repair parts for various makes of lamps. A trimmer cannot be expected to have detailed knowledge of all types of lamps, and sufficient care and attention are lacking. Responsibility is also divided in the matter of satisfactory operation. Only recently the point was brought up forcibly. A merchant having purchased his own lamps, complained to the manufacturer that the lamps were not satisfactory. The manufacturer advised that the station people did not trim the lamps properly. The outcome was considerable trouble, and the station adopted the policy thereafter of purchasing and owning the lamps.

Summarizing, if a central station is not in position to handle interior arc lighting and desires to hold back as much as possible from doing business, there is no better way than by refusing to furnish lamps. On the contrary, if it is desirous of conducting an active, satisfactory and economical arc-lamp business, the lamps should be the property of the electric-light company and furnished free to merchants.

MODERN METHODS OF STREET ILLUMINATION, IDEAS ON LAMP SUSPENSION AND THE USE OF REFLECTORS.

The arc-lamp department is an invaluable aid to the central-station manager, as the time draws near for the renewal of the lighting contract between the town or city and the electric-lighting company. While conducting the business of interior arc lighting, the employes interested can be continually investigating the lamps of this class designed for outdoor service. It is well to order a sample of weatherproof lamp, giving it a trial in front of your office, or, as an aggressive manager recently stated, he had the lamp installed in front of his residence, thereby to better watch its operation from night to night. When installing the lamp do not place it under a hood or upon the old-style lamp pole, but hang it from some attractive bracket or other form of suspension, giving particular attention to the height of the lamp from the ground. A distance of about 18 feet, measuring from the center of the inner globe, will give a very satisfactory distribution. If it is an alternating lamp, equip it with a metal reflector, over the outer globe, in order not to waste the light which would otherwise be thrown upward above the horizontal line from the arc. A reflector properly designed will not unduly concentrate the light beneath the lamp,

The policy here outlined, if pursued in a careful manner by a central-station manager, will tend to eliminate further reference in future contracts to the candle-power rating of an arc lamp. As an illustration, I would cite an actual case where a contract was recently made between a city and an electric-lighting company in the West. The 7½-ampere alternating, enclosed arc lamp was suspended at a point in the main business street of the city, and lo-

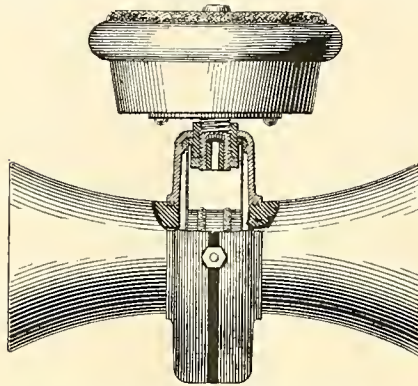


FIG. 3. HUTCHISON'S ELECTRICAL AUDIPHONE.

ated between two old-style 9.6-ampere series open-arc lamps. Opportunity was afforded those interested to make comparison of the light distribution, with the result that the contract subsequently entered into called for lamps designated as the 7½-ampere alternating, enclosed arc lamp. No reference whatever was made to candle-power rating.

While the tendency among the cities and towns is gradually in the direction of securing a lower price per lamp per year when renewing the street-lighting contract, yet the remarkable increase in the last few years in the amount of light used for interior lighting should encourage a liberal extension in the number of lamps required for street service. To educate the city fathers along these lines and to consummate a plan substantially on this basis will preserve the electric-lighting business and offer bright prospects for central stations, approaching the time when another contract must be made with their city government.

Hutchison's Electrical Audiphone.

The common interest manifested in the subject of affording relief to those afflicted with deafness has encouraged many attempts to provide suitable apparatus for overcoming this weakness, and in

held together by means of a spring, much the shape of the receiver used by telephone girls, which fit over the ears, and a metal breastplate on which is fixed, just in front of the mouth of the wearer, a transmitter shaped like those to be seen on some telephones. This transmitter is of rubber and is so arranged that it can be turned toward the mouth of the wearer or away from the wearer and made the receiver of sound. On this breastplate there is a switch to cut off the current and cut it in at will, so that the wearer can hear only the instructor, or, if so desired, his own voice and those of the remainder of the class. There is also a switch for controlling the intensity of the sound, as some of the ears of mutes are more sensitive to sound than others. This arrangement is so balanced that if it is found that one ear is more sensitive than the other the volume of sound can be adjusted for each ear.

The principle upon which this instrument operates is thus explained by the inventor: Sound waves upon striking the diaphragm of the receiving instrument produce variations in the current strength of the circuit, thereby producing a corresponding variation of the ear-piece diaphragm. This action is a microphonic one; but the construction of the special parts renders this instrument not only very sensitive, but especially adapted to the use to which it is to be put.

The drum and general auditory apparatus of deaf persons are very sensitive to loud sounds through this instrument, and in order to obviate any inconvenience or pain from this effect the regulator is inserted, whereby the sensibility of the instrument may be varied to suit different sound intensities. This regulator may be placed on the top of the handle.

An idea of the appearance of this instrument is given in Fig. 1, and the details of construction are clearly shown in Figs. 2 and 3. The principal features claimed by the inventor are an electrical ear-piece, a receiving instrument and an electrical circuit, including the ear-piece and the receiving instrument supported by a handle. The device for regulating the intensity of the current and its effect is contained in the handle and may be operated by the subject.

Of the inventor and his work it is reported by a correspondent at Mobile, Ala., that he is consulting and supervising electrical engineer for the Seventh and Eighth Lighthouse Districts, and for the Mobile Light and Railroad company, a native of Mobile, and graduate of the Alabama Polytechnic Institute. His work first attracted general attention when its use enabled Liman Gould and Martin Durant, two young men born totally deaf, to hear and articulate voice sounds, which they repeated as far as they were able. Hutchison is only 22 years old, and has devoted nearly three years to the perfection of his apparatus, which, in the opinion of local medical men, is the most perfect instrument invented for the purpose of enabling the deaf to hear.

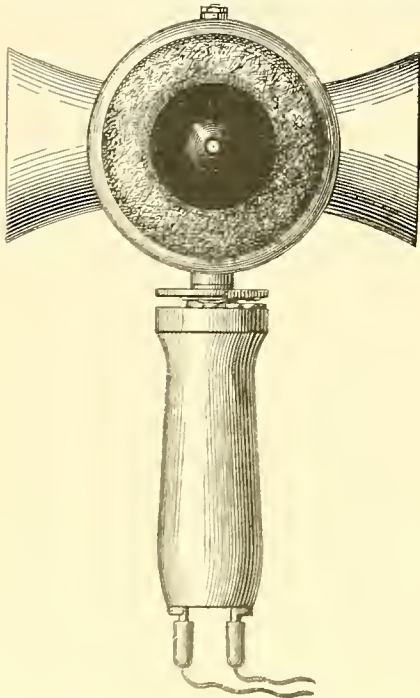
On the same electrical principle employed a larger apparatus has been constructed, by which an instructor can communicate speech to any number of pupils at one time without confusion. Hutchison has put together a portable instrument with a small pocket battery, by means of which a deaf-mute was enabled to hear the playing of a piano at a distance of 60 feet and to distinguish a voice in ordinary conversational tones.

The young inventor had previously made a local reputation as an expert electrician, and in order to learn what to avoid as injurious to subjects he has been studying the formation of the ear at the Alabama Medical College and otherwise perfecting himself in this special branch.

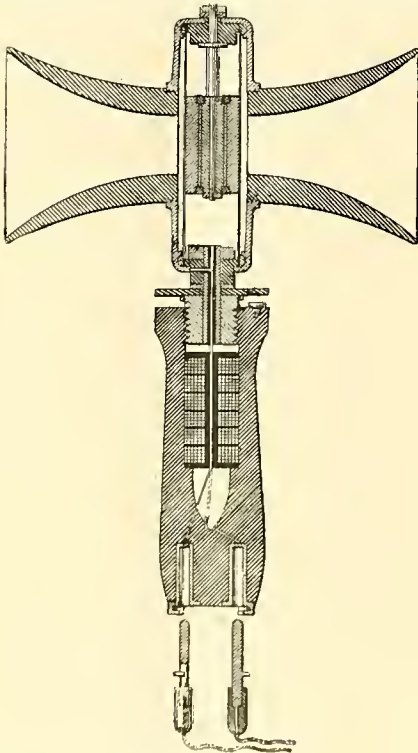
Death of Capt. A. E. Hunt.

Alfred Ephraim Hunt, president of the Pittsburg Reduction company of Niagara Falls, died in Philadelphia, Pa., on Wednesday, April 26th, aged about 41 years. He was born in Massachusetts and passed his early life at Hyde Park in that state. He attended the Boston Latin School, and on his graduation there entered the Massachusetts Institute of Technology, from which he was graduated in 1876. His earliest business connection was after he left college and went to Nashua, N. H., and became interested in the steel business there. Later on he went to Pittsburg, Pa. He there started the Pittsburg Testing Laboratory. In August, 1888, he met Charles M. Hall, the possessor of valuable patents for the manufacture of aluminum. In these patents Mr. Hunt saw the road to the cheap production of the much-sought-after metal, and, becoming deeply interested, he organized the Pittsburg Reduction company.

Mr. Hunt was one of the first to recognize the value of the great power development at Niagara, and it was his company that was first to make a lease of power and land from the Niagara Falls Power company, the plant being established before the power was on tap. This plant is known as the Upper Niagara works, and since it was built its capacity has been materially increased, while another plant has been erected on the lands of the Niagara Falls Hydraulic Power and Manufacturing company, which, even while the sands of his life were ebbing away, was being enlarged, thus demonstrating still further the correctness of his appreciation of the electrical service at the falls. It is well known that the company Mr. Hunt organized to make aluminum has practically become the only



FIGS. 1 AND 2. HUTCHISON'S ELECTRICAL AUDIPHONE.



will uniformly distribute the rays over a wide range of area.

As to the best combination of globes, clear inner and outer globe produce a very good lighting effect, but an opal inner globe is highly recommended instead of a clear one. With this combination the glare of light does not seem to be cut off sufficiently to be noticed, even by a keen observer, yet it is away entirely with the violet color of the arc, furnishing a beautiful illumination, free from shadows and desirable in all respects. No hood is required for the modern street lamp, and this feature, among others, contributes to its attractive appearance.

many cases remarkable results have been obtained. The latest contribution noted is that of Reese Hutchison of Mobile, Ala., who has patented a device known as the "akouallion." The invention relates to audiphones, and is intended to provide an efficient instrument to enable deaf people to hear sounds as they are heard by people with normal ears, and to train the ears of deaf persons to hear even without the instrument. It is claimed also that the machine will enable those who have been deaf and dumb from birth not only to hear, but to talk, to articulate letters, then words and finally sentences.

The instrument consists of two rubber ear-pieces

successful concern in the world to manufacture the white metal, the company supplying both the markets of the United States and Europe. During his lifetime he witnessed the price of aluminum drop to its present low stage, thus increasing its popularity.

The deceased was a man well known in Europe as well as America, and he was always pronounced a most successful organizer. In engineering circles of the two continents he was prominent. He was a member of the American Society of Civil Engineers, the American Institute of Mining Engineers, the British Iron and Steel Institute and the British Institute of Civil Engineers. He also belonged to various other organizations.

When a year ago the call came for men to take part in the late war with Spain, Captain Hunt, as he was generally known, responded. He had always been interested in military affairs, and was a member of the Pennsylvania National Guard for 14 years, being the oldest captain in the service. He went to the front at the head of the famous Battery B of Pittsburg. While at Camp Thomas he contracted malaria, but recovered so that he was able to go to Porto Rico with the General Miles expedition. He was, however, forced to ask for leave of absence, owing to poor health. He was a man of pleasing address and great popularity. He leaves a wife and one son. The burial was in Pittsburg, Pa. O. E. D.

Rare-oxid Incandescent Lamps.

F. M. F. Cazin of Hoboken, N. J., contributes some information upon the subject of utilizing the oxids of rare metals in an electric lamp. He has been occupied with this subject for several years, he says, and as early as 1892 he secured a patent bearing upon the problem. Several additional patents affecting different branches of the subject have since been issued to him. Mr. Cazin believes that he is entitled to some consideration as an expert in this field, and he takes issue with Mr. Carl Hering of the Electrical World, whose views conflict with Mr. Cazin's. The following statements are particularly objectionable:

It seems to have been shown that the rare-oxids do not have the valuable property of changing heat into light.

Their utilization in the production of light is dependent on combustion and does not rest on any particular power of emissivity.

Hence it seems to be useless to expect an improvement in the incandescent electric lamp by the use of these oxids as coatings of filaments.

Commenting upon these conclusions, Mr. Cazin says:

"The first proposition, as well as the second and third, were directly based on what a Frenchman named Bunte had said or was understood to have said in a paper published by a physical society to which he belongs. No other authority is quoted in support of the quite extraordinary conclusions to which this paper has led. As will be shown, the Frenchman did not make the statements that are attributed to him, and if he had made them, his paper would deserve less credit than a dissertation on heat written by a high-school pupil after his first lesson in physics.

"The first proposition, as verbally cited, is a formal and general denial of a theorem in physics, which is accepted by the living generation of scientists, and which teaches that all solids convert heat into light, when heated to conditional temperature.

"The second proposition falsely teaches that the heat that results from combustion is a different heat from that produced by the electrical current. This is surely new teaching, and if it be not false teaching, better evidence in its favor must be found than that which is derived from Bunte's paper, though Bunte himself advanced no such teaching, and only his interpreter, Carl Hering, in the Electrical World of April 22d, found the same therein."

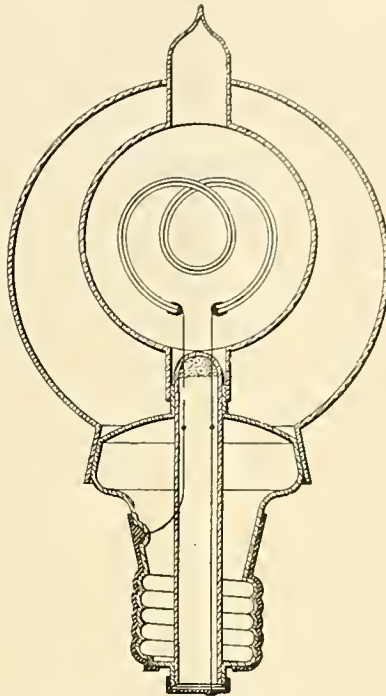
Mr. Cazin describes his own experimental work in making "an effective electric-oxid lamp," in the course of which he says:

"The third proposition is a remarkable general denial of the practicability of a technical problem of the very simplest conception, namely, the problem of converting accumulated heat into light, such accumulation being applied to material which at this date is in general use for a similar purpose. The newness of the present problem consists exclusively in the origin of the accumulative heat and in the subtlety of the contrivances which must be dealt with in the solution of the new problem.

"Heat is the lamp's food, and it is too valuable to be allowed to escape indiscriminately into space, in such enormous quantities proportionally as my calorimeter proved had escaped from a submerged incandescent vacuum lamp under current, even when the bulb had been made impenetrable to light. Heat is preserved in my lamp by applying an extra glass-housing, leaving a space, air-filled or evacuated, between the inner and outer bulb, as shown in the cut. By permitting a minor part of the inner bulb to project and to remain in direct contact with the cooling atmosphere the special advantage is secured of condensing within the minor projecting part all the products of evaporation from the luminous body, and of keeping the bulb proper free from all darkening deposits on its inside. Incidentally, and as a matter of greater economy, I designed an all-glass base-part, requiring no cementing and less manipulation in the manufacture of the lamp.

"In the matter of conductivity, it was found that a luminous body of carbon and oxids in direct contact

not only rapidly decreased in resistance, but once having been exposed to the current and then switched out of circuit, and after cooling, had entirely lost its conductive quality. An investigation showed that the carbon filament had almost entirely disappeared, and a very irregular scattering of spots of reduced metal remained on the contact face. When I applied the remedy of chemical insulation by coppering the carbon filament or gilding a filament of a metal, though of an extremely high point of fusion, I had to intercept the insulating coat by ring-shaped in-



RARE-OXID INCANDESCENT LAMP.

tervals, to prevent increase of conductivity. While this resulted in a practical luminant, not only did the exterior, corresponding to the interceptions of insulation, appear in more brilliant incandescence, but investigation showed that also in this case the stated reaction had taken place, but had been confined to the narrow annular interceptions, causing an alloy coating on the contact face. This metal coating, jointly with reduced metal from the oxids, must, in a second use of the lamp, have acted as the conductor, until the oxids, sufficiently heated, filled the gap, or the conductor stubs must have acted as arc pencils, until the oxids became conductive and offered less resistance than the automatically intercepted filament. In this connection attention should be directed to the important fact that no arc lamp proper, or such in its function, can possibly utilize

of pseudo-fibers or fabrics, fritted into adhesive and cohesiveness by an admixture of fluor spar and application of momentary excessive current to the well-protected conductor.

"It is evident that, with a complete protection of the core against oxygenation, the vacuum may be dispensed with, as already provided for in my patent, No. 523,461.

"No. 620,649 secures the luminous body of conductor and oxids with the indispensable intermediate insulating stratum. But the same patent secures also the luminous body of oxids with a filament of material not in affinity with oxygen.

"No. 621,291 secures the use of oxid in the shape of pseudo-fabrics."

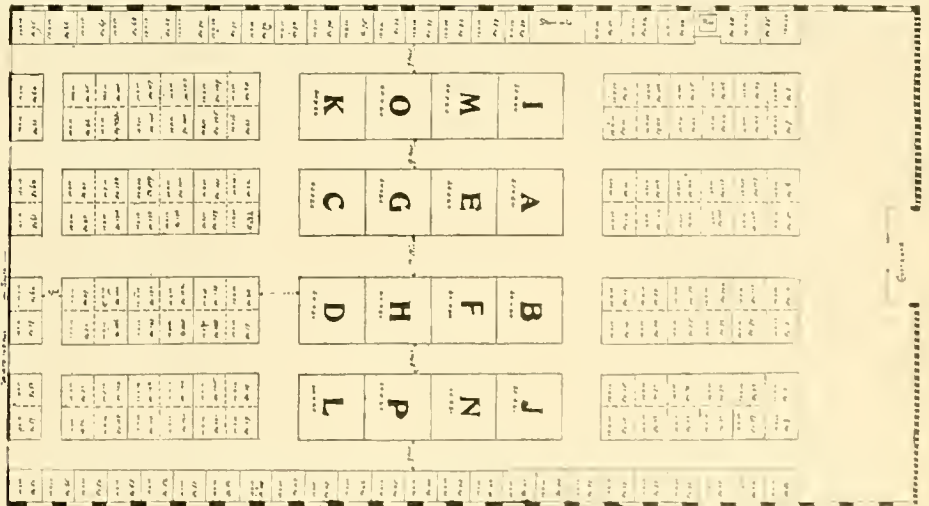
Electrical Exposition in Chicago Next Fall.

Chicago is to have an electrical exposition on a large scale next fall unless the carefully prepared plans of the National Exposition of Electrical Arts company fall to the ground, which does not seem to be likely. This company has been incorporated in this state and has an authorized capital of \$50,000. The officers are: President, N. J. Heinbach; secretary, T. Carrabine; treasurer and manager, W. E. Burnham. Messrs. Carrabine and Heinbach are business men of experience and Mr. Burnham is an energetic young man who has given considerable time to the promotion of enterprises of this character.

The show is to be held at the Tattersalls building on Sixteenth street, near State street, and will be followed by the exhibits shown in connection with the annual convention of the American Street Railway association. The time set for the electrical exhibition is from September 25th to October 9th. The date of the street-railway convention is October 17th to 20th.

It is the intention of the promoters of the exposition to give a general electrical exhibition, paying particular attention to household uses of electricity and displaying likewise the latest advancement of the electrical and allied arts. It is hoped that there will be demonstrations of liquid air, wireless telegraphy, the Nerst electrolytic lamp, X-ray phenomena and the like. These will be conducted in a manner to interest the general public, and it is anticipated that the show will be a great popular success, especially as it will be given at the time of the fall festivities in Chicago, which will excite great local interest and attract thousands of out-of-town visitors. Of course, the illumination of the exhibition hall will be a feature, and there will be interesting exhibits of motor applications of many kinds, heating and cooking by electricity, electric vehicles, new telephone apparatus, methods of telegraphy, etc. The Chicago Edison company will furnish power, in addition to the output of the plant in the building. On Sixteenth street, from State street to the entrance of the building, overhead festoons of incandescent lamps, across the street, will make the night approach to the scene a brilliant one. Band concerts will be given daily.

Space will be leased to exhibitors at rates varying according to its size and location. The Tattersalls



ELECTRICAL EXPOSITION IN CHICAGO NEXT FALL.

rare-metal oxids for increase of light efficiency, for the simple reason that oxid pencils do not conduct and that in order to become fit for such utilization the arc lamp must cease to be an arc lamp and must become a continuous-conductor lamp, or a filament lamp, by inserting the hot oxids, as conductor, though of different success material at intervals. The condition of practical success consists in so regulating the initial resistance that it be higher than that of the heated oxids. Of the experience thus described I took advantage in applying the coat of oxids only to those parts of the conductor where the insulating coat is intercepted, and where they show the higher brilliancy of incandescence. But in locally bridging over the gaps in the insulation I still preferred to decrease solid volume and to increase the light-emitting surface by applying the oxids in the shape

building is 148 feet wide and 205 feet long. It was built for large exhibitions and shows, and is well adapted for the purpose. The accompanying diagram shows the manner in which the floor space has been divided for the electrical show. There are 149 exhibit spaces ranging from 100 to 400 square feet. In case of very extensive exhibits two or more sections may be combined. The aisles are from nine to 12 feet wide, and plenty of open space is left at the entrance of the building.

Among the concerns that have already signified a determination to take part in the show are the Chicago Edison company, Chicago Telephone company, Postal Telegraph-cable company, Woods Motor-vehicle company and the American Electric Vehicle company. It is probable that gold medals will be awarded for excellence of exhibits.



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CONTENTS OF THIS NUMBER.

Table listing contents of the issue with page numbers, including Great Northern Electrical Plant, Arc-lamp Department of Central-station Business, etc.

DEPARTMENTS.

Table listing departmental contents such as Correspondence, Electric Vehicles, Technical Schools, etc.

The annual statements of the Chicago Edison company and the Commonwealth Electric company would prove satisfactory to the stockholders of these corporations and gratifying to the management.

the consolidation of the several plants into one company is a high recommendation of the efficiency and practicability of the methods introduced by the new management.

Announcement is made elsewhere in this issue of the decision of Judge Adams of the United States District Court at St. Louis in the case of the Edison Electric Light company against the Imperial Electric Light, Heat and Power company of St. Louis, refusing a preliminary injunction for which application had been made on the ground that the defendant was infringing the Edison three-wire patent.

The case excited a great deal of interest, owing to the fact that the exact value of the patent involved had never been fully established. No court had ever passed upon its merits, although the patent was constantly being invoked and was generally regarded as an important weapon.

The facts thus related seem to have had considerable influence upon Judge Adams, for he bases his action in refusing the preliminary injunction upon these grounds:

First—There has been no adjudication by any court of concurrent jurisdiction of the validity of complainant's patent, after a hearing on the merits.

Second—There has been no such public and general acquiescence in complainant's rights to an exclusive monopoly in the three-wire system of electrical distribution as to raise a fair or reasonable presumption of the validity of the patent.

The result of this decision is to open the three-wire invention to general public use, as the term of the patent has nearly ended, and it will be impossible to secure a decision in a contested case prior to the expiration of the patent—a direct result of the policy of the company in avoiding an adjudication of the merits of the invention.

A significant feature of the experimental work on the Marconi system, now being conducted on the English Channel, was the practical use to which it was put in time of danger by the crew of a vessel disabled in a collision.

A cable dispatch from London, April 28th, announced that the Goodwin Sands lightship was run into by the British steamer R. F. Matthews during a dense fog. The lightship was provided with the signaling apparatus, and by it the crew was enabled to notify the station at South Foreland that the vessel was sinking.

Commenting upon this practical demonstration of

the importance of the Marconi system for this particular service at least, a London correspondent says: "This object lesson has done more than experiments to impress the public mind here with the value of the Marconi system."

The negotiations for a transpacific cable between British Columbia and New Zealand and Australia are not as far advanced as had been supposed. In the House of Commons, on April 28th, the government was questioned on the subject.

The postponement of the Hawaiian cable project at the late session of Congress allowed the British government to take the lead again with its scheme of cable communication between Canada and Australia, and we are likely, therefore, to find two systems where we now have none.

Similar considerations will govern the selection of the route for the American cable, and these will appeal to the United States government and undoubtedly secure the financial encouragement and support necessary for the building and operation of the line.

The delays and disappointments that have met the promoters of the American cable project have been exasperating, but they have been no greater than those experienced by the Canadian and colonial petitioners for a British cable, which has been under consideration for more than a dozen years.

The example of the British government should insure an early settlement on the part of the United States of the question of establishing American cable connection with Hawaii, Manila, Japan and China.

FINANCES OF ELECTRICAL PROPERTIES.

Three important statements of electrical properties are presented herewith, two being central-station plants and the third a manufacturing enterprise. The excellent showing of these three concerns may be accepted as a fair indication of the general condition of prosperity that prevails in all branches of electrical industries.

Chicago Edison Company.

The annual statement of the Chicago Edison company for the fiscal year ended March 31st is appended:

BUSINESS SUMMARY.

Gross income from electric current and merchandise sales.....	\$ 1,954,876.69
Operating, repairs and renewals and general expense.....	1,214,620.72
Net income from all sources.....	\$ 740,255.97

CHARGES AGAINST INCOME.

Interest on bonds and debentures.....	\$262,524.46
Dividends paid.....	398,972.00
Balance.....	\$ 79,659.51

ASSETS.

Plants, real estate and franchises.....	\$ 10,098,421.39
Material in storeroom and unfinished work unbilled.....	180,213.77
Accounts and notes receivable.....	237,432.93
Cash.....	79,095.11
	\$10,595,153.20

LIABILITIES.

Capital stock.....	\$ 4,975,000.00
Bonds and debentures.....	4,808,000.00
Accounts and notes payable.....	332,462.43
Depreciation reserve.....	290,000.00
Insurance fund.....	36,000.00
Surplus account.....	101,698.29
Open accounts.....	51,092.48
	\$10,595,153.20

As shown below, there is an increase of 17 per cent. in gross receipts, in spite of the usual reduction in prices. The receipts for the 12 months covered by the report were only four per cent. smaller than for the 15 months ended March 31, 1894, including the World's Fair period. The net earnings for the year were \$740,255; bond and debenture interest, \$262,524; leaving a surplus applicable to dividends of \$477,731, equal to 9 1/2 per cent. on the outstanding capital stock. After paying the eight per cent. dividend there was a surplus of \$79,659, of which \$50,000 was carried to a depreciation reserve account and \$8,000 to insurance fund, the surplus account being increased by \$21,660.

The principal change in the balance sheet was caused by an increase of \$545,223 in plant account and the issue of \$350,000 more of the new five per cent. bonds. The following table, showing the results of former years' operations, will be interesting, as indicating the steady growth of the company:

Year ending March 31.	Gross.	Expenses.	Interest.	Earned on stock.	Dividends.
1899.....	\$1,954,876	\$1,214,620	\$262,524	\$477,731	\$398,972
1898.....	1,664,803	985,338	226,681	419,844	397,072
1897.....	1,549,608	948,934	280,334	419,340	397,518
1896.....	1,461,031	898,517	158,135	404,432	389,382
1895.....	1,437,942	953,377	155,128	328,537	319,038

It is announced that at the annual meeting on June 12th the question of increasing the capital stock will be settled.

Commonwealth Electric Company.

The first annual report of the Commonwealth Electric company of Chicago, which will be submitted to the stockholders at the annual meeting this month, shows a surplus of \$25,155 over the bond interest, and emphasizes the benefits of combinations insuring a reduction of fixed charges and an economical management. The statement is for the year ended March 31st, but it should be remembered that the consolidation was not carried into effect until June 1st, and it was some time later before the power stations were combined. The net earnings for the first seven months of the year were \$60,919, as against \$68,147 for the last five. The surplus shown will be put into betterments and extensions of the property. The company will probably spend \$200,000 in extending its business this year.

The statistics of the business and financial statement are appended:

BUSINESS SUMMARY.

Gross earnings from electric current and merchandise sales.....	\$ 390,065.51
Operating, repairs and renewals and general expense.....	260,998.77
Net income from all sources.....	\$ 129,066.74

CHARGES AGAINST INCOME.

Interest on bonds.....	\$ 103,910.78
Balance.....	\$ 25,155.96

ASSETS.

Plants, real estate and franchises.....	\$7,323,323.12
Material in storeroom and unfinished work unbilled.....	37,724.56
Accounts and notes receivable.....	228,320.68
Cash.....	5,220.58
	\$7,595,198.21

LIABILITIES.

Capital stock.....	\$5,000,000.00
Bonds.....	2,500,000.00
Accounts payable.....	45,339.41
Open accounts.....	247,902.87
Surplus account.....	25,155.96
	\$7,595,198.24

General Electric Company.

The annual statement of the General Electric company was submitted at the stockholders' meeting at Schenectady, April 26th, by President Coffin, as follows:

"The prosperity which has attended other lines of business during the year has been shared by your company. The important extensions made to its factory plants during the last 18 months have proved to be most timely, and the company is now greatly benefited by the increased facilities they afford.

"The matters of stock reduction and revaluation of the patent account of the company were brought to your attention in the last annual report. Since then a reduction has been made of 40 per cent. in the share capital of the company, by vote of the stockholders at a meeting specially called for that purpose, the common stock being reduced from \$30,-

descent-lamp orders nine per cent. Over 124,000 separate supply orders were received and over 8,499,000 incandescent lamps were ordered during the year.

General Griffin mentions the fact that the Spanish war led to an increase in the demand for search-lights, cables, marine dynamo sets and other apparatus of this class.

The report of the third vice-president deal entirely with questions of manufacturing and engineering practice. Several additions to the company's plant are mentioned.

The financial affairs of the corporation occupy the greater part of the report. They are considered in detail in the statement of the second vice-president, which includes the accompanying summary in the form of "consolidated balance sheet" and "consolidated profit and loss account."

American Institute of Electrical Engineers.

At the meeting of the Institute held in New York on April 26th there was a topical discussion on "The Limitation of Power Subdivision by Electric Motors in Manufacturing Establishments." Mr. Gano S. Dunn opened the discussion. Others taking part were Messrs. R. T. Lozier, H. B. Coho, H. Ward Leonard, Arthur Williams, Jesse M. Smith, Oberiin

ASSETS.		CONSOLIDATED BALANCE SHEET OF JANUARY 31, 1899.		LIABILITIES.	
PATENTS, FRANCHISES AND GOOD-WILL.....	\$ 4,000,000.00	CAPITAL STOCK.....		Cumulative Preferred.....	\$ 2,551,200.00
FACTORY PLANTS.....	3,400,002.00	Common.....	18,214,000.00		\$ 20,827,200.00
REAL ESTATE (other than factory plants).....	616,034.72	STOCKS AND BONDS.....	7,226,422.45	5% GOLD COUPON DEBENTURES.....	5,700,000.00
CASH.....	\$ 1,947,997.21	CASH.....	\$ 1,947,997.21	ACCRUED INTEREST ON DEBENTURES.....	47,000.00
Less amount in Banks set aside to pay final accumulated dividend (\$19.05% per share) on preferred stock.....	486,173.68*	NOTES AND ACCOUNTS RECEIVABLE.....	5,086,679.82	ACCOUNTS PAYABLE.....	431,479.44
	1,461,823.53	WORK IN PROGRESS.....	597,335.95	UNCLAIMED DIVIDENDS.....	41,729.14
		INVENTORIES:	5,594,015.77		
		Factories.....	\$ 4,271,033.95		
		General and Local Offices.....	606,339.82		
		Consignments.....	52,864.30		
			4,882,238.10		
			10,476,253.87	PROFIT AND LOSS.....	156,570.99
			\$ 27,174,506.57		\$ 27,174,506.57

*As a dividend of this amount was declared on February 10, 1899, and paid on March 3, 1899, it is anticipated and deducted here, and charged off in the Profit and Loss Statement for the year.

Debit.		CONSOLIDATED PROFIT AND LOSS ACCOUNT OF JANUARY 31, 1899.		Credit.	
BALANCE JANUARY 31, 1898 (Deficit).....	\$ 11,725,561.03	Reduction of Capital Stock Aug. 17, 1898:		Preferred Stock—reduced 40%.....	\$ 1,700,800.00
Reduction of book value of Patents, Franchises and Good will, June 30, 1898.....	4,000,000.00	Common ".....	12,184,000.00		\$ 13,884,800.00
	15,725,561.03	Balance carried down.....			1,540,761.03
					15,725,561.03
BALANCE BROUGHT DOWN (Deficit).....	1,840,761.03	Sales.....	\$ 15,679,430.86		
Cost of Goods sold.....	\$ 11,275,612.48	Royalties and Sundry Profits.....	792,590.82		16,472,021.68
General Expenses, Taxes, Sundry Losses and Allowances for Losses.....	1,818,922.07	Dividends and Interest received on Stocks and Bonds owned.....	341,999.76		
	13,094,534.25	Interest and Discount.....	110,053.61		461,553.37
Patents and Patent Expenses.....	269,440.41	Profit on sales of Stocks and Bonds.....	324,402.03		
Interest on Debentures.....	290,000.00	Discount on Debentures purchased and canceled.....	2,421.68		326,553.71
DIVIDENDS ON PREFERRED STOCK:					
All accumulated dividends, viz:					
From July 1, 1893, to Dec. 31, 1896—paid.....	1,041,740.00				
From Dec. 31, 1896, to Aug. 17, 1898—payable March 3, 1899.....	186,173.68†				
Current 7% dividend from Aug. 17, 1898, to Jan. 31, 1899—paid.....	81,638.40				
	1,609,552.08				
BALANCE JANUARY 31, 1899 (Surplus).....	156,570.99				
	\$ 17,260,658.76				\$ 17,260,658.76

*On \$6,000,000 for four months and on \$5,700,000 for eight months.
†See foot note to Balance Sheet

460,000 to \$18,270,000, and the preferred stock from \$4,252,000 to \$2,551,200. The patent account has been reduced from \$8,000,000 to \$4,000,000."

The profits for the year, after deducting all general, patent and miscellaneous expenses, were \$3,896,884.10. Deducted therefrom of August 18, 1898, after reducing patent account and capital stock.....

Less interest on debentures and current dividend on preferred stock.....

On January 31st there had been paid or charged against surplus all the old accrued dividends on preferred stock.....

Surplus January 31, 1899.....

The first vice-president's report of the sales department for the fiscal year ended January 31, 1899, showed total sales of \$15,679,430.86; cost of goods sold, general expenses and taxes, including sundry losses and allowances for losses, of \$13,094,534.25; leaving a profit on sales of \$2,584,896.61.

The increase over last year in orders received is 21 per cent. Apparatus orders represent 52 per cent. of this increase, supply orders 39 per cent., incan-

Smith, Douglas Burnett, George Hill and F. M. Petersen.

At the meeting of the executive committee in the afternoon the following-named associate members were elected: Joseph Clement, Johannesburg, South Africa; R. Laurie Ellis, Augusta, Ga.; John Ellis, Lonsdale, R. I.; Albert F. Ganz, Hoboken, N. J.; A. P. Kennedy, Chicago, Ill.; W. H. Lawrence, New York, N. Y.; Oliver S. Lyford, Jr., Pittsburg, Pa.; Raymond S. Masson, San Francisco, Cal.; M. Namba, Kioto, Japan; John S. Peck, Pittsburg, Pa.; Walter Wilson Reed, Houston, Texas; Edward F. Schurig, Omaha, Neb.; Charles Edward Skinner, Pittsburg, Pa.; Gerard Swope, Chicago, Ill.; Walter Farrington Wells, New York, N. Y.; Robert A. Widdicomb, Chicago, Ill.; Walter Douglas Young, Baltimore, Md.

The following-named associate members were transferred to full membership: H. Eugene Chubbuck, Quincy, Ill.; William S. Barstow, Brooklyn, N. Y.

Another new electric road is announced between Saginaw, Mich., and Frankenthum, a distance of eleven miles.

DEVELOPMENT OF THE TELEPHONE FIELD.

Independent Telephone "Trust."

The promoters of the independent telephone "trust" failed to perfect their organization and secure the necessary capital to float the enterprise by May 1st, the date when the options which they held expired. Word comes from New York that an attempt is being made to secure extensions of these options, the first appeal having been for 30 days additional time, but, this failing, 10 days was asked.

Representatives of the consolidation have repeated their efforts to enlist several large concerns in the enterprise, as it is now generally admitted that the companies upon which options have already been secured do not represent a controlling interest in the telephone manufacturing business.

Last week P. C. Burns spent several days in New York with Mr. Blaine, who has charge of the scheme, and Mr. Williams, the assistant United States treasurer of the Chicago sub-treasury, who has been in the East for more than a month in the interest of the proposed "trust." They were unable to bring the negotiations to a successful termination, however.

The only event of real interest connected with the scheme was the announcement in the Chicago papers of April 27th of the incorporation at Springfield, Ill., of the American Independent Telephone company of Chicago, with capital of \$2,500. The incorporators named are George H. Taylor, Albert Martin and George C. Wilder, of the law firm of Taylor & Martin, Chicago. It was at once assumed that the company was a branch of the "trust," and was incorporated in this state for the purpose of doing business here, but Mr. Martin says: "So far as I know, it has nothing to do with the trust."

Not in the "Trust."

The following letter has been received from the Hipwell Manufacturing company of Allegheny, Pa. It is being circulated among exchange managers, and is self-explanatory:

"It has been reported that we have given an option upon our plant to the independent manufacturers' telephone trust. This we emphatically deny, notwithstanding the fact that they have threatened to force us out of the business.

"We have refused all their offers, as we did not deem it to our or your best interests to accept them. We have both been fighting one trust, and we feel confident that you will not foster another whose sole purpose is to raise the price of telephone apparatus.

"Although we have been marketing a complete instrument for a comparatively short time, our business has grown to such magnitude that we have been forced to double our capacity. We are building an addition to our factory, which will be completed in about 30 days. This addition will give us the largest capacity of any independent telephone manufacturer in the United States. We manufacture every part of our telephone and depend on no one for supplies. We feel confident that whether the trust goes through or not, by combining merit with fair dealings, we shall receive the support of the independent telephone exchanges."

The Hipwell company makes a specialty of magnets, bells, receivers, transmitters and telephone supplies, and it has a complete exchange system developed.

Stromberg-Carlson Expansion.

The official announcement was made last week that "the Independent Telephone Manufacturing company, with a capital stock of \$100,000, has been organized, under the laws of the state of New Jersey. It is expected that this company will take up the manufacture of the well-known Stromberg-Carlson telephone apparatus. It will have no connection of any sort with any other company."

The new company will make Chicago its headquarters; the factory will remain in this city and the management will be continued in the same hands, but the business will be conducted on a larger scale and the facilities for manufacture will be materially increased. The new capital will be used for improvements and extensions and for securing new machinery.

The old company has enjoyed a prosperous career and has established a splendid reputation for the character of its apparatus. It is not the intention of the management to wipe out the old concern, but to simply transfer to the new company the rights and privileges of the old, keeping the organization of the Stromberg-Carlson company intact.

MANUFACTURERS AND DEALERS.

The Central Telephone and Electric company of St. Louis has just issued its new instruction book and illustrated catalogue No. 5, which contains much matter of interest to managers and users of independent telephones. As is well known, the company, under the careful and energetic management of Fred H. James, S. Cumling has worked up an important trade, particularly in the western states. The Central company's business has increased in a gratifying manner, and it is now prepared to furnish

anything used in a telephone exchange. Telephone people generally are bound to find something of interest in the Central company's catalogue, which will be cheerfully mailed on request.

F. O. Plummer, formerly of Plummer, Ham & Richardson, Worcester, Mass., will in the future be located at room 20, 620 Atlantic avenue, Boston. Mr. Plummer announces that, having obtained the agency for L. M. Ericsson's Swedish telephones, he is prepared to do all kinds of the finest telephone construction. Microphones, receivers and other parts of Swedish telephones will be kept constantly on hand.

The D. A. Kusel Telephone and Electric Manufacturing company of St. Louis has just issued a new illustrated catalogue and price-list. This catalogue contains illustrations and descriptions of all the products of the company, together with instructions for connecting telephones, estimates of material required for exchanges, testimonial letters, etc. The D. A. Kusel company was established in 1886, and Mr. Kusel claims to be one of the first men to engage in the telephone business outside of the Bell interests. The company reports that it is doing a better business than at any previous time in its history, and its goods are said to be giving entire satisfaction.

New York Telephone Rates.

As announced last week, the New York Telephone company has decided upon a reduction in telephone rates for the borough of Manhattan, applying to all contracts made after April 20th. The new rates range all the way from \$75 for 600 messages a year to \$228 for 4,500 messages, the former rates having been respectively \$90 and \$240 a year. In the 600, 700, 800, 900, 1,000 and 1,100-message classes the new rate for additional local messages is eight cents each, a reduction of two cents. Extra messages in the 1,200 and 1,500-message groups will cost seven cents apiece, in the 1,800 and 2,100-message classes six cents each, and in the remaining classes, including those from 2,400 to 4,500 messages a year, five cents. Rates have also been reduced in the Westchester division.

The general manager of the company, U. N. Bethell, has issued a formal statement to patrons announcing the change and the terms imposed by the company upon those who desire to take advantage of the new rate. He says:

"The New York Telephone company has adopted a new schedule of rates for telephone service in Manhattan—ranging from 600 local messages a year for \$75 to 4,500 local messages for \$228—and has modified in some respects the conditions under which the service is furnished. It therefore becomes necessary to make a new contract with each subscriber desiring to accept the new rates and conditions.

"In making these new contracts it has not been found practicable to do otherwise than follow in general the method hitherto observed when reductions in rate have been made, viz., to make a superseding contract under the new schedule only at the end of the current annual term of the existing contract.

"No previous reduction of rate, however, has affected so many subscribers at one time as the present one. Consequently, a modification of the former practice has seemed proper, in order that all subscribers who make new contracts may practically secure the benefits of the new rates from May 1, 1899. To accomplish this the following method will be observed:

"The new rates will be offered to each present subscriber at the expiration of his current contract year. If a contract under the new schedule is made in accordance with such offer, and the advance payments required by the old contract have been made, an allowance will be made to the subscriber of the difference between the old and the new rates for the number of local messages covered by the old contract for the period between May 1, 1899, and the date of the new contract. The amount allowed under this rule in any case will be placed to the subscriber's credit on account of his new contract. In all other respects the adjustment of the account under the old contract will be in accordance with the terms of the contract and of the old schedule.

"If the subscriber so prefers, a new contract under the new schedule will be accepted to supersede the old contract before the expiration of the current-contract year, the superseding contract to take effect at the end of the current-contract quarter, but in this case no additional allowance will be made from the requirements of the old contract.

"A flat-rate contract may be superseded at the end of any month by a contract under the new schedule. Of the total number of flat-rate subscribers at \$240 a year, it is estimated that about one-half, say 1,250, can obtain a reduction of rate by taking service under the new schedule. These subscribers are invited to investigate the matter, and to arrange for contracts on such basis as may seem to them most advantageous.

"When annual terms under the existing contracts are about to expire, the subscribers affected will be advised in order that they may take steps to secure the advantages of the new rates and rules above mentioned."

Telephone News from the Northwest.

[From the Minneapolis correspondent of the Western Electrician.]

The Sheboygan County Telephone company of Sheboygan, Wis., will replace many of its open wires with cables and make other improvements and extensions.

Four different telephone companies are applicants for a telephone franchise at Appleton, Wis.

The Minnesota Telephone company has been granted a franchise for a toll line through Sandstone, Minn.

The People's Telephone company failed to make much of an impression at Grinnell, Ia. It was offered and controlled entirely by Des Moines parties.

The State Center (Ia.) Telephone company proposes to order materials for an exchange at once.

The Oregon Telephone company is installing a telephone exchange at Goldendale, Wash.

The local exchange at Marshfield, Wis., started in last August with 89 connections and now has 109.

The Wisconsin Telephone company will make extensive improvements to the toll station at La Crosse, Wis.

The Western Electric Telephone company will extend its toll wires west from Mitchell, S. D., to Chamberlain and to Woonsocket, S. D. Pierre will also be reached.

The Enterprise Telephone company has been formed at Edgerton, Minn., and it will build toll lines along the Omaha and Milwaukee railways as far as Heron Lake, Minn.

The Iowa Telephone company is joint defendant with the street-railway company at Keokuk, Ia., in an action for damages brought by little Johnny Tighe. A telephone wire broke and fell across the trolley wire, the loose end striking the boy and inflicting what is claimed to be permanent injury.

The council of Dubuque, Ia., has granted the Standard Telephone company a franchise for a local exchange, after an extended fight.

The local telephone exchange at Boone, Ia., will put in an additional switchboard of 500 drops.

F. E. Fee was voted a franchise for a local telephone exchange at Hartley, Ia.

The Fort Dodge (Ia.) Telephone company has added 70 connections to its exchange since March 1st.

The Ogden (Ia.) Telephone company expects to have its new exchange in operation by June 1st.

C. L. Parkhurst and Mr. Thorsrud of Eureka, S. D., have perfected a telephone-switchboard drop shutter which is said to possess many advantages.

The Minnesota Central Telephone company has combined with the Western Stearns County Telephone company of New Paynesville, Minn., and will proceed to construct the toll lines projected by the latter.

The local telephone exchange at Forest City, Ia., has over 100 instruments in use, and the cost for both office and residence service is only 35 cents per month.

E. B. Smith of Omaha has been selected for superintendent of the system of the Iowa Telephone company, succeeding John M. Baker, deceased. Mr. Baker was at the head of the organization for a number of years.

The Blue Earth Valley Telephone company of Winnebago City, Minn., has sold its toll lines in Southern Minnesota to the Northwestern Telephone Exchange company, but retains all the local exchanges. It contemplates extensive improvements to the local systems, including continuous service.

The Scott County Telephone company has been formed at Jordan, Minn., to build lines from Jordan to Lydia and other points in the county.

The Western Electric Telephone company will extend toll lines from Pipestone, Minn., to Heron Lake, making connections there with the Twin Cities.

The People's Telephone company has begun constructing a line from Stewartville, Minn., to Spring Valley, Minn., and also to High Forest.

The Dwelle Telephone company will rebuild the exchange at Plainville, Minn.

The Park Region Telephone company has been granted a franchise for a local exchange at Alexandria, Minn.

Minneapolis druggists have concluded that the profits from the use of nickel-in-the-slot telephones are too small and uncertain to risk the probable loss of trade that their introduction might cause, as the new arrangement is very unpopular.

NEW COMPANIES.

The new telephone exchange at Greer's, S. C., will give direct communication with Arlington, Gilreath Mill, Reece's and other nearby points.

The Marion (Va.) Telephone company, recently organized by D. D. Hull, Jr., of Pulaski, will build a continuous line between Bristol and Roanoke.

Among the incorporations reported from Dover, Del., April 22d, was the New York Telegraph and Telephone company, with capital stock fixed at \$5,000,000.

Since work was begun on the system of the West Virginia Telegraph company at Parkersburg, W. Va., the Bell Telephone company has reduced its charges more than 50 per cent.

COPPER AND ZINC.

The copper combination that has caused so much speculation and apprehension is now in existence. It was incorporated under the name of the Amalgamated Copper company, by the laws of New Jersey, on April 27th, with a capital stock of \$75,000,000. The officers are: Marcus Daly, president; Henry H. Rogers, vice-president; William G. Rockefeller, secretary and treasurer; Henry H. Rogers, William G. Rockefeller, Marcus Daly, Frederick F. Olcott, James Stillman, Roswell F. Flower, Robert Bacon and Albert C. Burridge, directors.

The articles of incorporation filed at Trenton state that the business of the company will be the mining, milling, converting, smelting, etc., of copper, silver, zinc, brass, iron and steel. The provisions of the charter cover practically everything the company is ever likely to want to do, and permits the company, among other things, to buy and sell buildings and smelting plants and acquire properties. It was reported at the time of the incorporation that the capital stock of the company will be increased on or before June 1st to \$250,000,000 with the possibility of an ultimate increase to \$400,000,000.

Marcus Daly, the president of the new company, is a well-known mining man, and one of the chief owners of the great Anaconda copper mine of Butte, Mont. H. H. Rogers and William G. Rockefeller are Standard Oil men, and A. C. Burridge, who is a Boston man, is one of the counsel of the Standard Oil company. Robert Bacon is a member of the firm of J. P. Morgan & Co.; Roswell F. Flower is the head of the firm of Flower & Co.; F. D. Olcott is president of the Central Trust company, and James Stillman is president of the National City Bank of New York.

The company has already purchased large interests in the Anaconda Copper company, the Parrott Silver and Copper company, the Washoe Copper company, the Colorado Smelting and Mining company and other companies and properties. It is asserted that among the properties which the company has taken over, or will soon secure, are all the Michigan copper mines and the Butte and Boston, and the Boston and Montana, and there are rumors that negotiations are pending also for the acquisition by the Amalgamated Copper company of a controlling interest in Senator-elect W. A. Clark's great United Verde mines in Arizona. But it is also asserted that the Calumet and Hecla mine of the Lake Superior region and the United Verde mines will not go into the trust.

The stock of the company is offered for sale at the par value of \$100 a share.

The Engineering and Mining Journal does not believe that the new company will be able to control the market. In relation to the demand and prices for copper that journal, in its issue of April 29th, says: "Business continues very active, and, as a result, values have improved still further. We quote Lake, 18½ to 19 cents; electrolytic in cakes, bars and ingots, 17¼ to 17½ cents; in cathodes, 17 to 17¼ cents, and casting copper, 17 to 17¼ cents. Consumption in this country keeps up on an unprecedentedly large scale, and notwithstanding the extremely high prices ruling there are as yet no indications that the business of manufacturers is being interfered with. As far as the London market is concerned, we have had a much steadier week than for a considerable time past. Values have not fluctuated as widely as they did the previous week; in fact, the changes have been of an infinitely small character, and conditions in general, considering the high prices that have recently been established, have been remarkably normal."

A London dispatch of April 26th says that the rise in the price of copper is seriously affecting the mid-land industries. The Kynoch company of Birmingham, manufacturer of arms, munitions, etc., has discharged over 1,000 hands, and the remainder of the employes of the factory are working half time. The government has ceased placing orders for copper, and the electrical firms are greatly hampered in filling orders for which contracts were made some time ago, based on a low price of copper. The Rothschilds and J. S. Morgan & Co. deny that they have any connection whatever with the American copper combination.

At Trenton, N. J., on April 25th, articles of incorporation were filed with the secretary of state for the Tennessee Copper company, with an authorized capital of \$5,000,000. The company is empowered to mine and work copper and other ore. The incorporators are Charles W. Welch, Joseph Reichert, Charles M. King, John B. Fisk and R. G. Ingersoll of Jersey City.

Zinc is also booming in price, 60 per cent. ore selling as high as \$56 a ton last week. The production of zinc is treated in an interesting manner in the following article from the Bulletin of the Boston News Bureau:

The recent rise in the price of zinc ore, which has been greater than the advance in foot copper, has brought American zinc properties before the public as never before.

This week [about April 22] zinc ores sold at \$52 per ton for 60 per cent. ore, which is the standard, or price paid by the smelters' agents at the mines varying above or below this price, according to the increase or decrease of the percentage of zinc in the ore. The previous highest was \$48.50 per ton. A year ago

the price was \$26 per ton, or one-half the present extreme price, and a few years ago the price was well below \$20.

The advance in zinc has been due to the exhaustion of important mines abroad, especially in Belgium, where they have been worked below the sea level and flooded; also to the increased consumption of brass, which is made of zinc and copper, and the expansion of the electric field and the development of the cyanide process for gold extraction. South Africa alone is said to consume 10,000 tons of zinc in the extraction of gold through the cyanide process. There is no such thing as zinc scrap. Zinc is eaten up or vaporized, and is more distinctly consumed than any other metal. It is estimated that in the production of \$10,000 in gold by the cyanide process two tons of zinc are eaten up. In the electric field the zinc is the only negative metal, and there is yet no substitute for it. It is very volatile, and in the ore-smelting process it is first vaporized, and then condensed. It requires three tons of coal to smelt one ton of zinc, and, therefore, zinc ores are carried to the coal fields or to the natural gas wells.

A few years ago we exported no zinc in ore or pig. The government reports show for the calendar years the following as the zinc exports of the United States in the last four years:

Year.	Ore, pounds.	Pig metal, pounds.
1895.....	48,000	3,060,805
1896.....	4,150,000	20,260,169
1897.....	16,520,000	28,490,662
1898.....	21,040,000	20,993,413

The world's production of zinc is said to be about 400,000 tons of zinc ore of which the United States is producing 255,000 tons per annum. Last year the United States produced 235,000 tons of zinc ore, an increase over 1897 of 53,000 tons. As three-quarters of the American supply comes from the Missouri-Kansas district, which will run above 50 per cent. of metallic zinc in the ore, the American production of zinc can be safely set down as now about 270,000 pounds, which was the American production of copper but a very few years ago.

As in copper, the positive metal in the electric field, so in zinc, America now controls the markets of the world. It would appear that America had not only the telegraph and telephone development of the world, but the electric-railway development, the electric-machinery development, and the control of both the positive and negative metals essential in the production and distribution of electricity. We make the following comparison of the present annual American production of copper, zinc and lead, compared with ten years ago and 1880:

	1880.	1889.	1899.
Copper, lb.....	60,480,000	231,246,214	560,000,000
Zinc, lb.....	46,478,000	117,720,000	270,000,000
Lead, lb.....	195,650,000	363,934,000	450,000,000

The great zinc field of America is at Joplin, Mo., and a radius of fifteen miles from the center of Joplin embraces the entire territory of zinc production in this region, so far as is now known. Smelting profits and mining profits here have been something astonishing, and miners who cannot read or write have been made millionaires from a few hundred acres of land.

It is said that the present high price of zinc ore is stimulated by the increased smelting capacity of the district, as smelters once started can close down only at considerable loss; but, as the foreign markets lead us in the advances in zinc or spelter, as the pure metal is called, the present industrial prosperity and electrical development may be looked to as the main spring of all other causes for advancing prices. It is said that there is 32 pounds of brass in the car bearings under each of the 1,500,000 cars of the United States, which have to be replaced four times a year, and this uses up a tremendous amount of both zinc and copper. Zinc is coming into use very largely for seal coverings. It has the clinging quality for the foothold, wears well and is not affected by the weather, but under strong heat it vaporizes and leaves no residuum as do other metals. Probably the largest use for zinc is in coating iron through the manufacture of galvanized iron. Galvanized nails are rapidly supplanting all other iron nails.

Dr. Hopkinson's Visit.

Dr. Edward Hopkinson of Manchester, England, brother of the late John Hopkinson, whose sudden death while mountain-climbing in the Alps last summer is still fresh in the minds of electrical men, is visiting the United States and was in Chicago last Saturday. Dr. Hopkinson is a well-known engineer, and has designed many improvements in dynamo-electric machinery. He also planned several of the English electric-railway systems. He visited the Harrison street station of the Chicago Edison company and several other electrical plants in Chicago, and was particularly interested in the Sprague multiple-unit system of electric-railway operation and the storage-battery installations. He expects to sail for England about May 13th.

Dr. Hopkinson says that the next four or five years is bound to witness a great advance in the electrical industry in Great Britain, particularly in the building and extension of electric-railway lines. The extent to which municipal control of street-railway enterprises is exercised in English cities has tended to discourage the investment of capital in new plant and apparatus, as the time permitted for returns on the investment is short. But more liberal arrangements are hoped for, and with them will come a large number of electrically operated systems.

The visitor was asked about the prospects of the Nernst electric light, but he was cautious in expressing an opinion about the new invention. He was not enthusiastic over the possibilities of the electrolytic lamp, but thought that possibly it might have a field of usefulness after considerable improvement.

Chicago Electrical Banquet.

Arrangements have been made for the third annual dinner of the Chicago electrical fraternity at the Grand Pacific Hotel, on Thursday evening, May 11th. The banquet committee having the arrangements in charge is composed of B. J. Arnold, Charles A. Brown, C. D. Crandall, Edward B. Ellicott, Angus S. Hibbard, Samuel Insull, George A. McKinlock, E. B. Kittle, W. J. Lloyd, W. H. Merrill, Jr., Fred Sargent, B. E. Sumy, C. H. Wilmerding and F. B. Badt.

An effort has been made to compile a complete list of men engaged in electrical pursuits in Chicago, but the committee realizes that many omissions must have been made. The secretary of the committee, F. B. Badt, requests that those who have not received cards send their names and addresses to him at 1504 Monadnock building. Responses to invitations should be sent to the secretary by May 6th. Tickets for the dinner have been placed at \$7.50.

Important Three-wire Patent Decision.

The motion for preliminary injunction in the suit of Edison Electric Light company against the Imperial Electric Light, Heat and Power company of St. Louis has been decided by the United States District Court at St. Louis against the Edison company. The opinion of the court, which is very brief, was delivered by Judge Adam, and is as follows:

"After a careful consideration of the proof before me I have reached the following conclusions, which I will state in a summary way:

"First—There has been no adjudication by any court of concurrent jurisdiction of the validity of complainant's patent, after a hearing on the merits.

"Second—There has been no such public and general acquiescence in complainant's rights to an exclusive monopoly in the three-wire system of electrical distribution as to raise a fair or reasonable presumption of the validity of the patent. In fact, the proof shows quite the contrary. Divers parties appear to be employing the three-wire system in direct and intentional disregard of the complainant's claim to a monopoly therein. Such being the facts, it is clear that no case is presented for a preliminary injunction. The parties' rights must be determined after proof taken and a hearing on the merits."

Richard N. Dyer and A. C. Fowler appeared for complainant and Charles A. Brown and George H. Knight for defendants.

This decision, it is claimed, practically opens the three-wire invention to unrestricted public use, as the complainant having avoided a hearing of the case upon its merits until so late in the life of the patent, it will now be impossible to secure a decision of the court in a contested case prior to the expiration of this patent.

Detroit Street-railway Ownership.

The opponents of Governor Pingree's plan for municipal ownership of street railways in Detroit have secured the services of Professor C. A. Kent, said to be the ablest constitutional lawyer at the Detroit bar. Professor Kent proposes to bring injunction proceedings against the commission in the Supreme Court. He gave out an authorized interview, in which he said:

"This is the first tangible movement in the direction of socialism. It is the first evidence of a concerted action, and is the first indication of the crystallization of a communistic sentiment, which has been preached and initiated with much vigor for the last decade. We do not know what the limitations of such a movement will be when once it is started. We cannot conceive whether they will result in confiscation and the curtailing of private rights. If the city goes into the street-railway business, there is nothing to prevent it from organizing itself into a socialistic commonwealth.

"This is not a case where the Detroit Street Railway Commission and the street-railway company of this city are alone interested. There is not a great public utility operated by a corporation in the country that is not more or less affected by this experiment, and there is not one of them that will not feel the danger of socialist tendencies if they ever get a start. The decision which will be given by the Supreme Court will spread its influence all over the whole world, into the homes of all classes of people. It is not a decree of the law so much as it is a decree of sociological importance, and places or fails to place the limitation upon socialistic enterprises."

National Electric Light Association.

Mr. C. O. Baker, Jr., master of transportation of the National Electric Light association, gives notice that the Trunk Line association, the Central Passenger association, the Southeastern Passenger association and the New England Passenger association have granted a rate of fare and one-third, on the certificate plan, from points in their territory and return, for delegates and friends attending the twenty-second convention of the association, to be held in New York on May 23d, 24th and 25th. The following-named gentlemen will have charge of transportation matters for their several localities: Mr. W. Forman Collins, 510 Marquette building, Chicago, Ill.; Mr. H. A. Wagner, Missouri Edison company, St. Louis, Mo.; Mr. C. E. Hesser, Cincinnati Gas Light and Coke company, Cincinnati, O.; Mr. Morris W. Mead, city electrician, Pittsburg, Pa.; Mr. R. F. Ross, 620 Atlantic avenue, Boston, Mass.; Mr. H. B. Cutter, 1112 Sansom street, Philadelphia, Pa.; Mr. S. C. D. Stern, city electrician, Denver, Colo.; Mr. H. M. Atkinson, Georgia Electric Light company, Atlanta, Ga., and Mr. E. R. Weeks, Kansas City Electric Light company, Kansas City, Mo.

City Lighting in Ottawa, Ill.

The annual report of the superintendent of the lighting department of Ottawa, Ill., shows that 136 city lights have been maintained at a cost of \$5,484.71 for the year.

Power is furnished by the Thomas Electric Light and Power company, in whose station the city's dynamos are placed. The company furnishes oil and waste and attendance for the city's generating plant, the total charge last year being \$2,803.12.

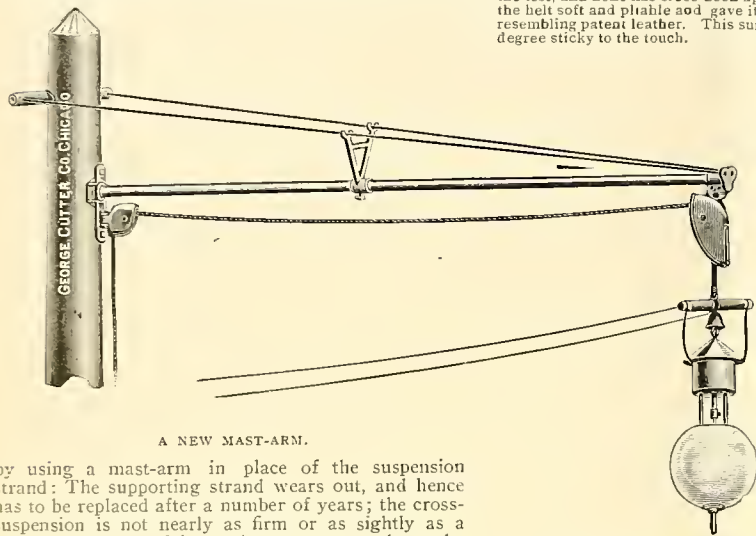
The pole lines and lamps belong to the city, and

lamp renewals, repairs and replacing of carbons are items of expense.

The original plant was installed April 1, 1891, at a cost of \$13,000, and additions have since been made at an expense of \$3,054.87, bringing the total cost to date \$16,054.87. It is estimated that the present value of the plant is \$10,885.05. In the items of expense no provision is made for depreciation, nor is any charge made for interest on investment. The following paragraph from the superintendent's report shows that the city is now confronted with the serious problem involved in depreciation, etc.: "During the coming year the outside construction will require considerable repairs, the poles, cross-arms and pins having arrived at that stage where age has begun to affect them, principally by rot. The dynamos will require more attention and repairs than formerly; age has affected them also."

A New Mast-arm.

The old method of supporting street arc lamps from a cross-suspension wire, while very good in its way, has three objections, all of which can be avoided

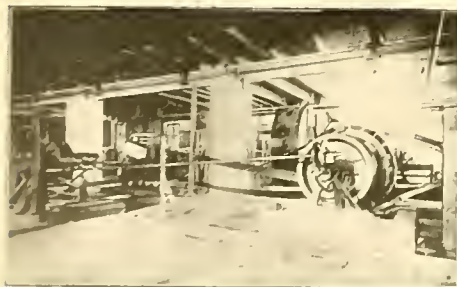


A NEW MAST-ARM.

by using a mast-arm in place of the suspension strand: The supporting strand wears out, and hence has to be replaced after a number of years; the cross-suspension is not nearly as firm or as slightly as a good mast-arm, and it requires an extra pole at the opposite side of the street. All three of these objections are being more strongly felt now than they have been in past years. The decreasing margin of profit on street-lighting contracts makes it necessary to do away with parts that wear out; the demand for a faultless service means that lamps loosely supported will lead to "outage" rebates in windy weather, and the objections raised by property owners to poles in front of their land make a smaller number of poles advisable.

As the natural result of these tendencies, there has been a growing demand for mast-arms in the West, as well as in the East, though this has been checked by the high cost of the older types of such fixtures. Seeing this and knowing the readiness with which its well-known lamp-supporting pulley would lend itself to making a firm and safe fixture, the George Cutter company of Chicago has brought out the new mast-arm represented in the cut.

The steel strain rods run from the rigid wrought-iron strain arm at the back of the pole to the outer pulley, which supports the lamp from its safety knob. The double bracing keeps the lamp from swinging



always in the wind; the pulleys are weatherproof, and the whole mast-arm is very quickly put up. The new form will be known as Cutter's Junior mast-arm, to distinguish it from the Standard mast-arm made by the same company. It is said to be quite inexpensive and is already in use at a number of points in the central western states. Some of the engineers think that it solves the problem of getting the advantages of a mast-arm without the high cost of one which has been on the market for many years.

The Waterbury (Conn.) American announces that a combination of electric-railway interests, including the Waterbury Traction company, has been formed. Just what companies are included cannot be learned, but it is stated that the combination will include nearly, if not quite, all the electric-railway interests in Connecticut.

Cling-surface Tests.

At the request of the Kling-surface Manufacturing company of Buffalo a series of tests has been made at Sibley College, Cornell University, under the direction of R. C. Carpenter, professor of experimental engineering, for the purpose of determining the relative results of the company's product. Professor Carpenter's report is appended:

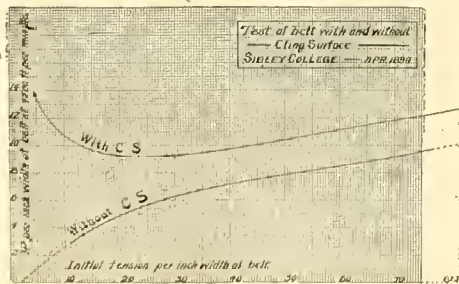
The tests were made in every case on the belt-testing machine (Fig. 1) owned by Sibley College. This is constructed so that the belt can be tested under ordinary running conditions and measurements can be made for determining the power supplied, the power delivered, the tension on the belt, the arc of contact on either pulley and the slip. This machine has been used in extensive investigations for determining the efficiency of belting, and is described in Vol. xv, Transactions American Society of Mechanical Engineers. Three belts have been tested, each before and after treating with cling-surface, and each under various conditions of loading. In all, over 50 tests have been made; a considerable number of observations have been repeated in order to check the accuracy of the results.

The belts before testing were in every case clean and in good condition and running under rather better than average conditions. The cling-surface was applied on several successive days and in small quantities, in accordance with the directions supplied by the manufacturers before commencing the test. The material was almost wholly absorbed at the time of starting the test, and none has since been applied. The material made the belt soft and pliable and gave it an inner surface somewhat resembling patent leather. This surface was only in the least degree sticky to the touch.

The general results of the test with cling-surface show an increased transmitting power as compared with the same belt in an untreated condition; it also shows an increased arc of contact, and very much less slip. It shows a very high transmitting power when the belt is run extremely loose or with very little tension on the pulleys, the reverse of which is true with the untreated belt. It will be seen by consulting the report that the greatest transmission capacity for the belt treated with cling-surface was found when there was the least possible tension on the belt and when the belt was running so slack that the sides were nearly touched. It will be noted also that as the tension of the belt was increased the transmitting capacity diminished until a tension of about 20 pounds per inch of width of belt was reached, after which the transmitting capacity commenced to increase, and from that point continued to increase with increase of tension.

In the test of the same belt not treated with cling-surface the results were quite different, inasmuch as the capacity with very light tensions was practically nothing and the capacity increased as the tension increased; at no point, however, did the untreated belt have even approximately the same capacity as the treated belt with the same tension; and moreover the treated belt transmitted much more power with a very light tension than the untreated belt with a heavy tension. The test with the belts treated and untreated running on wooden pulleys showed essentially the same characteristics. The general effect of the cling-surface appears to enable the belt to transmit a power equal to its entire capacity without producing heavy stresses on the driving boxes of the pulleys, or in other words it enables the full capacity of the belt to be obtained for transmitting power when the belt is so loose that the sides nearly touch.

The general results of the tests of the untreated and treated



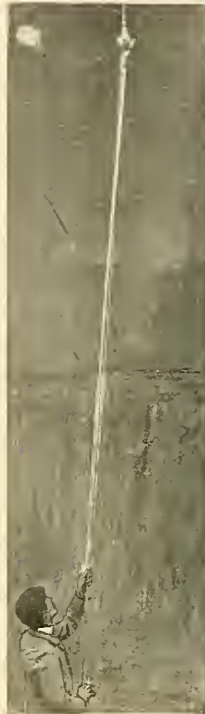
FIGS. 1, 2 AND 3. CLING-SURFACE TESTS.

belts when running on iron pulleys is shown in the accompanying diagrams, Figs. 2 and 3. In Fig. 2 the horizontal distances show tension on the belt in pounds per inch of width, the vertical distance shows the horse power transmitted per inch of width of belt for a speed of 4,500 feet per minute. The lower line represents the results obtained with the untreated belt, the upper line the results obtained with the treated belt. It will be noted that the lower line continually rises, showing an increase in capacity with an increase in tension; the upper line descends at first, showing a decrease in capacity with increase in tension; and later rises. In no place does the transmitting capacity of the treated belt fall below that of the untreated belt. In comparing the respective results it will be noted that the treated belt has a carrying capacity of 13.8 horse power when the tension per inch of width is five pounds, while for the same conditions the untreated belt has no carrying capacity; furthermore, it is noted that the carrying capacity of the treated belt, even at this low tension, is nearly 40 per cent. higher than that of the untreated belt even when the tension has been increased to 80 pounds per inch of belt width. The diagram in Fig. 3 shows the arc of contact and the maximum percentage of slip for belts run both in the treated and untreated condition with different tensions and on iron pulleys. From this it is seen that the slip of a treated belt is much less, and the arc of contact greater for a given total tension than with the untreated belt.

The falling off in carrying capacity with increase of belt tension for the treated belt is doubtless due to the rapid change in

the arc of contact, which diminishes with increase of tension. This causes a diminution in the transmitting power, which is greater than that produced by the increase of pressure due to the increased tension on the belt. With the untreated belt such change is very slight, and consequently a falling off in carrying capacity for light tension takes place.

In regard to the questions raised as to the preservative qualities of cling-surface and to the permanency of the effect produced by its application, the writer would say that our tests have of necessity been of too short duration to give conclusive answers. The general effect of the cling-surface is to soften the belt and to put it apparently in the best condition for transmitting power and retaining its good qualities. The surface produced by the cling-surface remains apparently unchanged after several weeks of use, and the inference to be drawn is that the



INCANDESCENT LAMP MANIPULATOR.

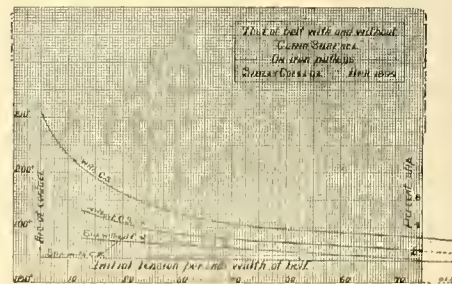
material has an effect which continues permanent for some time at least.

Incandescent Lamp Manipulator.

"An ingenious and simple 'handy tool' " is the description of the instrument illustrated in the accompanying cuts. This manipulator for incandescent lamps is meeting with ready sale in the hands of the Incandescent Electric Light Manipulator company of 116 Bedford street, Boston.

Most incandescent lights in large buildings are at such heights and angles that it is necessary in replacing or cleaning them to erect staging, use long ladders or boatswain chairs, which take two or more men considerable time to handle, and there is also the liability of scratching interior finish and chipping stucco work, to say nothing of the risk of accidents to the men so employed. With the device herewith shown, one can keep burnt-out lights replaced and clean the lamps without the aid of scaffolding, ladders, etc.

The manipulator is light in weight, but mechanically built to last, and all parts can be duplicated. The



nippers are lined with rubber, and can be made to fit any shaped bulb. The ordinary manipulator will remove from 16 to 52 candle power street bulbs and 16 to 32 candle power indoor bulbs of any standard make, and can be built to work at any height or angle. The pole can be telescoped to suit different heights, and it makes it handy for handling street lights or for laying aside when not in use. Every manipulator is tested before being shipped, and is fully warranted. It is recommended for cars, depots, steamboats, street lamps, public halls, hotels, stores, theaters, churches, fine residences, public and office buildings and show windows. The device is now in use in Boston, Mass., at the state house, Mechanics' building, City Hospital, Trinity Church, Mission Church, American House, Paine's furniture warehouses and subway, and by the elevated-railway people and Department of Public Grounds, and also in many other towns and cities all over the United States and in foreign countries.

Elliptical Carbon Patent Litigation.

The United States Circuit Court for the Western District of Pennsylvania rendered a decision on April 24th, in the suit brought by the Elliptical Carbon company of Chicago against the Solar Carbon and Manufacturing company, Joseph K. Cass and F. B. Laughlin, officers of the Solar Carbon and Manufacturing company of Pittsburg. The patent involved in this suit was that of Samuel P. Parmlly, No. 540,800, issued June 11, 1895, upon an electric arc lamp. This patent, although upon an arc lamp, covers more particularly the so-called elliptical carbons, well known to the trade, which are adapted to burn in electric arc lamps and give double duration to the burning time of a lamp with one trimming.

The character of the invention will be understood from the following claims, which are selected from nine which the patent contains, and all of which were involved in the suit:

1. A pair of carbon pencils for an electric arc lamp, burning the pencils by holding them in line end to end and having a feed mechanism adapted to adjust the pencils toward one another as they are consumed, formed each with a total cross-sectional area approximately twice that of the round carbons ordinarily employed on a circuit carrying the same current, and at least one of them formed as a flattened bar or prism of elliptical cross-section with a thickness at the minor axis approximately equal to the diameter of the ordinary round carbon.

6. A pair of carbon pencils for an arc lamp adapted to be presented to one another end to end and to be adjusted toward one another as they are consumed by an arc passing between them, formed each as a flattened bar or prism thickest at the middle and becoming thinner toward the edges as and for the purposes described.

The court sustained the patent, and ordered a decree in favor of the plaintiff, enjoining the defendants from the manufacture of the so-called elliptical carbons and directing an accounting of damages and profits.

The invention of the elliptical carbon by Mr. Parmlly was made at a time when the Brush double-carbon lamp patent was threatening to give a monopoly of the all-night lamp to the Brush Electric company. The application for patent was involved in a series of interferences, but Mr. Parmlly was ultimately adjudged to be the inventor, and was awarded the patent which was involved in the suit referred to.

The patent had been generally respected. One suit had been begun against the Calumet Gas company in Chicago, but no adequate defense was made, and a decision was reached by the court giving the Elliptical Carbon company an injunction. Subsequent to this decision at Chicago, suit was brought against the Solar Carbon and Manufacturing company, which has just been decided in favor of the complainant.

The case was elaborately argued on November 29, 1898, and the effect of the dimensions of the carbons set forth in the patent was demonstrated to the court by a practical exhibition of the arc projected by means of a lens upon a screen. In this way it was shown that when the dimensions of the carbons differed from those set forth in the patent to Mr. Parmlly, instead of getting the arc which gradually weaved back and forth across the ends of the carbons, lingering slightly at the ends of each excursion, but not becoming localized at any other place (which was the action of the arc with the carbons of the Parmlly patent), the arc between carbon plates would become localized and would leap from one place to another, causing a momentary extinction of the light, and thus render it intolerable for use. This demonstration made to the court was in direct contradiction of the statements of the experts for the defendants and of counsel for the defendants, who asserted most positively that this traveling arc, which had been described as the result secured by the elliptical carbons of the Parmlly patent, was "an impossible action." The court decided that the defenses set up by the Solar Carbon and Manufacturing company, including prior public use, prior publication, prior invention and non-infringement, were none of them sustained by the proofs.

The complainant was represented by Charles A. Brown & Cragg; the defendants by the well-known attorneys who represent the Westinghouse Electric and Manufacturing company, Kerr, Page & Cooper.

Cable from the United States to Germany.

President McKinley has approved the project of landing a direct German cable on the coast of the United States, and his action brought a cordial message of appreciation from the German kaiser. The new company is to be known as the German-American Telegraph company, and among those interested in it are prominent firms in Germany as well as a number of Americans. The details of organization have been in charge of Mr. Sporer, in New York. The German terminus of the new cable will, it is understood, be at Ems, a town and watering-place in the province of Hesse-Nassau, Prussia, near Coblenz. The American terminus is expected to be at New York. The route of the line is by way of the Azores, a Portuguese possession, so it is presumed that concessions have also been obtained from Portugal. This will be the first cable ever laid between Germany and the United States, and, with the exception of the Franco-American cable, will be the only transatlantic line not touching on British soil.

Cable Ship for the Philippines.

(From the New York Tribune.)

Washington, April 28.—General Greely says that the United States transport Hooker will be placed under the orders of Major Joseph E. Maxfield on Saturday. She will sail from New York on Monday, carrying Major Maxfield, Lieutenant Clarke and 25 men of the regular Signal Corps to replace Signal Corps volunteers in the Philippines. The ship carries 212 miles of deep-sea cable and all the gear necessary for laying, recovering and repairing the submarine cable. The cable is entirely of American manufacture. It will be used to connect such islands and points as General Otis may deem necessary for military administration. It is expected that this system will supplement the cable lines of the Eastern Extension Telegraph company to such an extent that General Otis will be able to communicate speedily with all the important islands of the Philippine archipelago. Major Maxfield, who is in command of the expedition, is a graduate of Harvard, has served 17 years in the Signal Corps, and performed gallant and distinguished service in Cuba.

The progress of the expedition will be watched with interest, it being the first effort of American manufacturers and American officers to lay a deep-sea cable of such length in distant waters. In addition to the cable, the Hooker carries materials and instruments for 1,000 miles of land lines, 100 telegraph offices and 100 telephone stations. These supplies, with those already in the Philippines, are sufficient for the construction of 2,000 miles of telegraph and cable lines. The present Philippine system consists of about 300 miles of cable and 1,850 miles of telegraph lines. The cables are those of the Eastern Extension Telegraph company, laid and maintained under concessions and with promises of subsidies from Spain. The land lines are now the property of the United States, but fully 1,000 miles are occupied and operated by the Filipinos. The Hooker will go through the Suez Canal, and should reach Manila about June 20th.

The Hooker is the old Spanish prize the Panama, the second to be taken in the war with Spain. The little lighthouse tender Mangrove had the credit of the capture, and her crew made a neat little sum in prize money. She still bears many reminders of the Spaniards in the decorations of her cabin. Only one design was removed, and that was a handsomely executed Spanish coat-of-arms. The Hooker has been entirely refitted from stem to stern, and is said to be a model cable ship. She is 325 feet long and 35 feet beam. Her tonnage is 2,935. On her stern are mounted two six-pounder rifles, and in the magazine is a large amount of ammunition. She also carries magazine guns.

Electrical Production of Aluminum.

It is expected that the somewhat famous suits over the patented process for the manufacture of aluminum will be heard on appeal in the United States Court for the Northern District of New York, at Utica, N. Y., next October, Judge Cox presiding. The case is entitled the Cleveland Electric Smelting and Aluminum company against the Pittsburg Reduction company, and is some years old. The suit is one wherein the Pittsburg Reduction company is sued by the Cleveland Electric Smelting and Aluminum company for alleged infringement on two patents issued about January, 1892, to Charles S. Bradley, involving, as claimed, the process practiced at Niagara Falls in the manufacture of aluminum. In all there are 10 claims attached to the papers being prepared by the Cleveland Electric Smelting and Aluminum company in the case. The patents were applied for in February, 1883.

The nature of the claims set up may be judged from the following paragraphs taken from the patents:

"The process of obtaining aluminum from its ores or compounds consisting in passing an electric current through a forced portion of the aluminum ore or compound contained in an unfused body or heap of said ore or compound."

"The continuous process of separating or desiccating aluminum from its ores or compounds consisting in fusing and maintaining the fusion and electrolytically decomposing the ore or compound by the passage of the electric current therethrough, and charging the pots with fresh quantities of the ore or compound as the reduction proceeds, substantially as set forth."

It is understood that these patents were purchased by the Cowles people, who are interested in the Cleveland Electric and Smelting company, but who were then in Lockport, in 1885. After their issuance from the Patent Office, in 1892, a long litigation followed between the Cowles Electric Smelting and Aluminum company and a patent lawyer in New York, Grosvenor P. Lowry by name, who had also made a purchase of the patents from Bradley, probably under the assumption that the so-called original assignment to the Cowles people was not perfect. This suit against Lowry was decided in favor of the Cowles company, and it then began the present suit against the Pittsburg Reduction company.

In 1891 the Cowles company sued the Pittsburg Reduction company, under patents covering the same ground practically as those issued to the Cowles Brothers, but that suit had to be with-

drawn because the Bradley patents, bearing an earlier date of application than the Cowles patent, issued from the Patent Office, a signed to Lowry, who was then the American representative of the great aluminum company at the Falls of the Rhine, in Switzerland.

Charles M. Hall, the inventor of the process now used by the Pittsburg Reduction company, is now with that company at Niagara Falls. It is said that his early experiments were carried on in the Cowles plant then in operation in Lockport, N. Y. In 1892 the Pittsburg Reduction company sued the Cowles company under a patent that Mr. Hall secured. On trial, the United States Court in Cincinnati construed the Hall patent very broadly and enjoined the Cowles company from continuing the manufacture of aluminum, since which time the plant in Lockport has been closed. This suit has not as yet reached an appeal.

The process of making aluminum consists of fusing the materials from which the aluminum is produced in a large iron tank open at the top and lined over the bottom by a heavy mass of carbon. The electricity passes into the material fused by means of a number of heavy carbon rods three or four inches in diameter, the ends of which hang down into the liquid bath. The aluminum is deposited very much the same as nickel is deposited by electrolysis and collects as a mass of molten metal below the fused bath by aluminous material. No heat but that evolved from the electric current is used.

CORRESPONDENCE.

New York Notes.

New York, May 1.—The amended rapid-transit bill became a law last week. As it finally passed, the law embodies the governor's suggestions that the period of the franchise be limited to 50 years, with 25-year renewals at the discretion of the city authorities, and providing for free competitive bidding. Governor Roosevelt expressed himself as much pleased at the passage of the bill, and asserted that its enactment would not only give the people of New York city the rapid transit which they have long looked forward to, but would also provide an adequate return to the city for the valuable franchise thus granted if a private corporation is empowered to build the road. It is considered probable that the Third Avenue company will bid for the franchise for building and operating the road, and the owners of the Metropolitan street-railway system may renew their offer in modified form. The only offer now pending before the Rapid Transit Commission is that of the Metropolitan Contract company, of which Frederic B. Esler is president.

Anthony N. Brady has been made president of the New York Gas and Electric Light, Heat and Power company. The company has given to the Central Trust company a mortgage for \$21,000,000, covering its property at Ninety-seventh street and First avenue and its franchises and privileges. The mortgage runs for 50 years. The bonds are issued to take up the stock of the Edison Electric Illuminating company. The company filed a mortgage for \$15,000,000 on its property in December. This older mortgage is held by the State Trust company.

A week from to-day the electrical show in Madison Square Garden will be opened. The exhibition will continue until June 3d. On May 23d, 24th and 25th the annual convention of the National Electric Light association will be held in this city, and members and visitors will have an opportunity to see the show. Several popular features are planned, including a demonstration of the work of the Signal Corps of the regular army.

Senator Ford's bill taxing corporations operating under municipal franchises is now a law, and it is exciting a great deal of discussion. The theory of the measure is that profitable franchises should make a return to the people in taxes, but as the manner of arriving at the taxable value of franchises is left to local assessors, it is feared that there will be as many plans of fixing the value of franchises as there are boards of assessment. Street-railway, gas, electric-light, telephone and telegraph companies are affected by the law.

The Brooklyn Rapid Transit company assumes the management of the Nassau electric system and the Brooklyn Union elevated road to-day. Both will be operated in connection with the Brooklyn Heights road. President Rossiter has issued a general order announcing these appointments: Ira S. McCormack, general superintendent of transportation; J. C. Breckinridge, chief engineer of the construction and maintenance department; F. S. Drake, superintendent of shops, and Lincoln Van Cott, purchasing agent.

Canadian Intelligence.

Ottawa, April 29.—It has been decided by the Grand Trunk railway authorities to work the traffic over the new Victoria Jubilee bridge, across the St. Lawrence, at Montreal, on the electric-block system. The contract for the erection of the necessary plant has been placed in the hands of the Royal Electric company. The question of electrical block signaling has occupied a good deal of attention in railway circles recently.

The Town Council of Barrie, Ont., having just

gone into the municipal electric-lighting business, has fixed the lowest prices in Canada probably. Store lights start at \$5 per annum for single light, and grade to \$2 per light for 20 and over; residences, \$4 for one light, and \$1.50 each for 20 or over. Churches are given lights at \$1.50 each per year. Meter rates for 10 lights and over have been fixed at 10 cents per thousand watts, which is a reduction of 7½ cents on the light companies' rate. The town will spend \$10,000 in addition and improvement to the plant.

The Metropolitan Electric company of Ottawa, Ont., will in a few weeks place an order amounting to \$350,000 for the machinery in the power house to be erected at Britannia, eight miles from the city. The power house, when completed, will surpass any other in the Dominion, and will be thoroughly equipped with the most improved machinery. The plant will include 20 water wheels of 240 horse power each, four large generators, two small generators and switchboards, regulating machinery and appliances and safety devices.

Mr. Frank A. Cote of the firm of Cote & Coursoles, electricians of Ottawa, Ont., has invented a new lightning arrester, especially adapted for telephone lines. Mr. Cote's device was tested recently in the presence of the experts of the Bell Telephone company and proved highly successful, the strongest current being intercepted.

A project is on foot to build an electric railroad between Trenton and Westville, Pictou County, in the province of Nova Scotia, by way of the towns of New Glasgow and Stellarton.

It is stated that the various electric companies doing business in the city of Montreal, Que., in lighting, power distribution and passenger transportation, will be amalgamated, with a probable capital of \$10,000,000 or \$15,000,000.

The property holders of the city of Winnipeg, Man., voted a few days ago on a by-law to raise \$60,000 for the establishment of a civic lighting plant. The vote polled was 876 for and 231 against. It is claimed, however, that a number of those voting were non-residents, and that the necessary majority to carry the by-law has not been received.

Ahearn & Soper of Ottawa have received the contract for the equipment of the electric railway between Quebec and St. Anne de Beaupre, via Montmorency Falls and Beauport, a distance of 28 miles. The contract includes the power house, generators at Montmorency Falls, rotary transformers at St. Anne's and all the cars and electrical apparatus in connection therewith. The cars will be 55 feet in length and will be manufactured in Ottawa. The electrical apparatus is to be manufactured by the Westinghouse company. The line will be the longest electric railway at present in the Dominion.

A bill to incorporate the Nova Scotia Electrical Light and Heat company has passed the Legislature of that province. The company proposes to light by electricity the whole of the Annapolis valley from a power station to be situated on the Gaspereau River. The estimated expenditure is placed at \$400,000. One of the incorporators is the Hon. F. W. Borden, minister of militia for Canada.

A syndicate of Toronto capitalists, headed by Mr. J. A. Culverwell, electrical and mechanical financial broker, is reported to have purchased the Burleigh Falls water power, near Peterboro, Ont. The purpose is to develop the power and transmit it to Peterboro and Lindsay, 20 and 30 miles distant respectively. There is a head of 25 feet and an estimated power of between 300 and 500 horse power. The dam and power house will be located at Perry's Creek, at a point where the channel is so narrow that a concrete dam for the purpose can be built at a cost of about \$5,000. At Lindsay the town lighting contract has been secured for 10 years and business from power and light amounting to some \$15,000 per annum. The company will be capitalized at \$200,000.

The Ottawa Metropolitan Electric company has commenced the work of construction on its canal end power house near Britannia, five miles from Ottawa. The operations will be continued over a period of six months. W.

PERSONAL.

George F. Porter, secretary of the National Electric Light association, was in Chicago early in the week. He says that the convention of the association in New York this month promises to be a successful one. The programme will be issued in a few days.

S. Fugita, superintendent of the Tokio City Street Railway company of Tokio, Japan, was in Chicago early in the week. He is said to be visiting this country to investigate the practicability of compressed air as a motive power for street railways and to have been favorably impressed.

Professor Charles F. Chandler of the School of Mines of Columbia University, New York, has been nominated for president of the Society of Chemical Industry, which is now in session at Glasgow. Professor Chandler, it is said, is the first American to be nominated for the presidency of an English scientific society, and a nomination is equal to an election.

On April 27th Seabury C. Mastick, W. T. Morrill, W. K. Sparrow, Clarence Weissblatt, Reginald Pelham Bolton, Julius A. Bychower, H. B. Palmer, A. C. Walter, Walter Hinman Beebe, Frederick

Montgomery Holbrook, H. P. Merriam, E. T. Williams, Lewis B. Marks, F. E. Morgan, Arthur Williams, Solomon Davis and Charles L. Clarke of New York and vicinity were elected members of the New York Electrical society.

Prof. Andrew Jamieson has decided to retire from the position of professor of electrical engineering at the Glasgow and West of Scotland Technical College. It is stated that, owing to the amount of time which he has to give to telegraphic development, he is compelled to devote himself entirely to private consulting work. Professor Jamieson has been connected with the college for 18 years, and is the senior member of the staff. The resignation will take effect on July 1st.

ELECTRIC VEHICLES.

In answer to an inquiry from the French government, the secretary of the treasury has announced that horseless carriages or automobiles, or parts thereof, imported into the United States will be subject to duty at the rate of 45 per cent. ad valorem, "as articles or wares composed wholly or in part of metal, under paragraph 193 of the act of July 24, 1897."

The new Columbia Motor Carriage company of New York, which has absorbed the motor-carriage department of the Pope Manufacturing company of Hartford, Conn., has a capital of \$3,000,000. The officers are: President, Colonel Albert A. Pope of Boston; vice-president, George H. Day of Hartford; secretary and treasurer, Harold Eames, formerly a lieutenant in the United States army. Among the directors are William C. Whitney, P. A. B. Widener of Philadelphia, Stephen B. Elkins, G. B. Schley of Moore & Schley, the bankers; Colonel Pope, George H. Day and Harold Eames. It is said that the company proposes to extend its operations over the whole country, erecting factories in Chicago and on the Pacific coast. The Illinois Electric Vehicle company is said to be affiliated with the Columbia company. The Electric Storage Battery company will furnish the batteries.

ELECTRICAL SECURITIES.

The American District Telegraph company has declared a dividend of one per cent., payable May 15th.

TECHNICAL SCHOOLS.

All friends of technical education will regret the announcement that the electrical-engineering department of the Johns Hopkins University is to be discontinued. Lack of funds is said to be the main cause of the difficulty, as the instructors feel that the department is not able to accomplish its purpose upon its present financial basis. When the department was established, in 1886, funds then appropriated to its use were sufficient for maintaining a first-class course, and were ample up to the last three years. For three years, however, much of the original annual appropriation has been devoted to other departments. Cary T. Hutchinson is the associate professor of electricity; Hermann S. Hering, associate in electrical engineering; and Herbert G. Geer, associate in mechanical engineering. The resignation of Dr. Louis Duncan, the head of the department, who secured leave of absence last fall to engage in engineering work in New York, has already been received.

MISCELLANEOUS.

The Y. M. C. A. Electrical Club of Chicago announces an "electrical evening" at Association Hall, 153 La Salle street, for Friday, May 12th, the entertainment to begin at 8 p. m. Mr. A. V. Abbott, chief engineer of the Chicago Telephone company, will lecture on "Wireless Telegraphy," giving the audience a demonstration of the Marconi system in actual operation. Mr. G. W. Patterson will show his pleasing electrical spectacular effects, and there will be a "gramophone grand" concert.

TRADE NEWS.

A. O. Schoemaker, the New York mica dealer, is now represented in Chicago by the W. R. Garton company, Manhattan building.

The Berlin Iron Bridge company of East Berlin, Conn., gave its sixth annual oyster roast to its employees and their families on April 26th.

W. N. Matthews of 312 Commercial building, St. Louis, is general sales agent for the Ritter soldering iron, for which there is a large demand at the present time. Mr. Matthews reports good sales in second-hand machinery, especially in the Southwest.

The Cling-Surface Manufacturing company of New York will make an exhibit at the Electrical Exhibition, Madison Square Garden, New York, May 8th to June 3d, and endeavor to prove to the satisfaction of everyone that a slack belt with cling-surface will transmit more power than a tight one without it.

The demand for a lightning arrester and kicking coil for the protection of fan motors and other small power motors, at a low price, has encouraged the Garton-Daniels Electric company of Kookuk, Ia., to place on the market a full line of these devices.

The company will be glad to furnish full information and prices upon application.

George W. Patterson, the Chicago agent for the American Circular Loom company and Gordon batteries, has removed his office from 1539 to 1533 Marquette building. Mr. Patterson is an expert swinger of the electrical Indian clubs, and he is distributing to his friends and customers photographs showing the beautiful light effects thus obtained.

The Western Electric company has installed in the Robert Law building, 132 Water street, Chicago, two 100-kilowatt direct-current dynamos to furnish light and power for tenants. The same company has sold a 100-kilowatt dynamo to the Wolff Manufacturing company of Chicago and has built a 24-circuit arc-light switchboard for the Ottawa Electric company of Ottawa, Ont.

President H. K. Gilman of the Western Electrical Supply company is one of the busiest men in St. Louis, looking after the constantly increasing business of his company. The Western company has on hand a large stock of everything in the electrical line, and has the reputation for ability to fill all orders promptly. The company is certainly to be congratulated in having the services of such energetic men as H. K. Gilman and R. V. Scudder.

The Montauk Multiphase Cable company of New York has recently opened a Boston office in the Brazer building, 27-29 State street, at which place the various electrical adaptations of the cable are shown upon individual boards and sections of the dangerous parts of buildings. The Montauk Multiphase Cable company's business field is very rapidly developing, and many installations are now being made in various parts of the country. The recent disastrous fires in New York and Boston have created a notable demand for this cable.

The Groshon High-duty Pumping Engine company of New York has applied to the Supreme Court for a voluntary dissolution of the corporation. Judge Truax has set down the order to show cause for August 3d, and appointed Gilbert M. Speir referee. The application was made for Louis E. De La Vergne, Louis Baron and Adolph Bender, directors. The liabilities are \$214,947, of which there is due the De La Vergne Refrigerating Machine company \$214,196 for money advanced, and to John A. Groshon \$751 for services. The assets are about \$4,120. The company was incorporated in July, 1891, with a capital stock of \$10,000, to manufacture a high-duty pumping engine. The largest stockholders are Jacob Ruppert, as trustee for the De La Vergne Refrigerating Machine company, 666 shares, and John A. Groshon, 300 shares. The total number of shares is 1,000.

J. Holt Gates and R. J. Randolph, both widely known and experienced electrical salesmen, have formed a partnership as Gates & Randolph, with offices at 1420 and 1422 Marquette building, Chicago. Mr. Randolph has resigned his position as manager of the sales department of the Sterling Arc Lamp company of New York, and about the middle of this month expects to arrive in Chicago, where he was for several years western representative of the Excelsior Electric company. The concerns which Gates & Randolph will represent are the Sterling Arc Lamp company, the Warren Electric Manufacturing company of Sandusky, O., the Triumph Electric company of Cincinnati, Elmer Morris, the American Electric Specialty company and F. A. La Roche & Co. of New York.

R. J. Randolph, Jr., succeeds his father in the Sterling Arc Lamp company, and on May 1st took the position of general eastern agent for that concern. Mr. Randolph will look after the interests of the sales department of the Sterling company, and, in fact, do everything in the line of the general business of the company that might be expected of a "chip of the old block." R. J. Randolph, Jr., is a young man in the electrical business, but his rise has been a quick one and greatly to his credit. He started about three years ago in Chicago as city salesman for the Wallace Electric company. At the suggestion of his father he gave up this position to go East into the factory of the Excelsior Electric company in New York, with the view of fitting himself along the line of expert electrical work. His talents as a salesman, however, predominated, and he soon commanded the position of city salesman in New York for the Excelsior company, and he held that position until his present promotion to succeed his father.

The electrical fraternity will be interested to learn that the Commercial Electrical Supply company of St. Louis, which recently passed into the hands of William F. Nolker, sons and associates, has completed all its arrangements, and is now in a better position than ever before to make an active canvass for business. The company has unlimited capital and intends to push most energetically for its share of the supply trade. President William F. Nolker is one of the most widely known business men of St. Louis, and is actively interested in some of the largest St. Louis companies, such as the Mississippi Valley Trust company, Kinloch Telephone company, St. Louis Brewing association, Gilsonite Roofing and Paving company, and many other prominent and well-known concerns. Louis T. Nolker, treasurer, and William H. Nolker, secretary, are both

energetic young men and give promise of becoming very active in the electrical business. Vice-president Fred C. Laufketter is one of the best known electrical and mechanical engineers in the West, whose experience covers many years, and who now holds a number of prominent positions in the electrical and mechanical engineering line. Mr. Laufketter should prove a valuable acquisition to the staff of the Commercial company. Paul D. Cable, the former manager of the Commercial company, retains his position with the new company, and, as in the past, will leave no stone unturned to increase the business of his company. The company has increased its stock materially, and is now in a position to fill all orders promptly. The Commercial company is preparing a very fine new catalogue, which, it is said, will have no equal. This will be out in a few weeks and should be in the hands of every user of electrical supplies.

BUSINESS.

The A. Beck Electric company, 303 Market street, St. Louis, is working day and night to take care of its large fan motor business.

President Stanhope of the St. Louis Electrical Supply company, like nearly every electrical concern in St. Louis, reports a most flourishing business. The St. Louis Electrical Supply company is well known in the West, and has no trouble in securing its share of the electrical supply trade.

Vice-president A. C. Garrison of the Columbia Incandescent Lamp company, St. Louis, reports that the demand for Columbia lamps was never so brisk as it is at present. The "Columbia" is known the world over, and few users of lamps of the present day are unaware of the superior qualities the manufacturers claim for it.

The Chicago papers published an article last week to the effect that the Farr Telephone and Construction Supply company, 357 Dearborn street, Chicago, had been swindled out of \$14,000 by a man who claimed to be F. W. Montrose of Kingston, Ont. C. W. Farr, president of the Farr company, states that this is a mistake, as the company lost absolutely nothing in its dealings with the individual in question.

The Royal Electric company of Peoria, concentrating its energy on the development of alternating-current apparatus, with which it has been associated for the last 10 years, advances its claim as a specialist in this line. It says that it is the pioneer

in the manufacture of alternators of the inductor type, and lays stress on the advantages of machines of this character. It solicits correspondence from all interested in the installation or operation of electrical machinery.

Fisher & Cramphorn of Boston, manufacturers of switches, have merged their business into a new company, called the Atlantic Manufacturing company, located at Mansfield, Mass., where it will have a fine factory, fitted with all modern machinery, and where it will be able to ship all orders promptly, instead of having to refuse orders on account of lack of facilities. Mr. Fisher will be vice-president, and will take full charge of the new factory. Mr. Cramphorn will act as treasurer. This will insure customers the same goods as manufactured by the old firm. There will be associated with the gentlemen named Mr. J. S. Keenan as president.

The underwriters' rules are largely responsible for the lessening of fire risks in electric wiring. The Central Electric company, Chicago, has frequently anticipated these rules through the excellent selection of high-grade goods. While the use of non-inflammable tubes for wiring has long been enforced, there is a wide range in quality as handled by the different supply houses. The white clay tube, as carried in a full line by the Central Electric company, is highly vitrified and straight and sound throughout. The company reports a very heavy demand for all white clay tubes, and particularly for the most common size of five-sixteenth inch by three inches, with an outside diameter of nine-sixteenth inch. By boring with half-inch bit and driving this tube into the hole, a lasting fit is assured. The insurance motto of "time-tried and fire-tested" is claimed to be applicable to the Central Electric company's white clay tubes.

The hot season having come on suddenly, electric fans are in order, and as the season promises to be a long and hot one, those anticipating the purchase of fans will do well to place their orders early in the season in order to insure an early delivery. The Western Electrical Supply company of St. Louis, Mo., has made ample provision for its customers this season, and is receiving many orders early in the season for the fans which it supplies. The company considers this influx of orders to be due to the excellent reputation these fans have long enjoyed. For alternating current it is supplying the well-known Emerson model, improved '99 type; and the Paragon direct-current fans are being supplied where this current is in vogue. The fan season has a very

promising outlook at the present time, and the Western Electrical Supply company, from present indications, anticipates a phenomenal trade in this line. It is sending out by mail catalogues devoted exclusively to fans, and will take pleasure in naming special prices on application.

An electric recording meter is one of the most important devices in the equipment of a modern electric-light plant. A lack of accuracy in the meters used in recording a customer's consumption of current means a lack of accuracy in the entire financial results of the business. The central-station manager is therefore always alert for anything new in the meter line. The Electric Appliance company claims to have something of special interest in this direction in the Gutmann recording wattmeter, for which it has just taken the general western agency, and which it is now placing on the market. The company claims that the Gutmann meter will record with absolute accuracy on any load, beginning at 20 watts. This means that this meter will start and register the current consumed with accuracy even if the load is only equal to that of 1-3 of a single 16 candle power lamp. This claim is certainly worthy of investigation, and the Electric Appliance company is inviting the most rigid investigation of its claims for the Gutmann meter.

But few people realize the enormous quantity of crude rubber now being consumed annually in the manufacture of rubber goods throughout the world. Owing to the tremendous trade demands, coupled with the fact that the large wild rubber forests have been gradually exterminated by the natives girdling the trees in order to obtain a greater flow of rubber sap, it is claimed that the world is fast facing a rubber famine. The price on the finest grades has advanced 21 per cent. in the last year, and on the lowest grade, that of African flake, the raw product has jumped 62 per cent. It is conceded by experts that the future supply of crude gum must come from private cultivated rubber groves, and it is claimed that the fortunate owners of a producing rubber plantation will realize fabulous profits annually. Among the first to take advantage of the opportunities is a Chicago company, the Mexican Plantation association, which is said to be strongly backed financially. The concern is directed by men who have had wide experience in land development, while among the stockholders in the company can be found the names of many well-known, conservative business men. The complete plan of the association is well worthy careful consideration. The company has offices at 1603, 100 Washington street, Chicago, where full information can be obtained.

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued April 25, 1899.

623,511. Automatic Electric Circuit Breaker. Maurice Bouchet, Paris, France. Application filed January 31, 1898.

Circuit terminals and an electromagnet control the action of the switch, a part forming one cheek of the coil having an internal tubular polar extension gap, the other cheek having an internal polar expansion of decreasing section, and a sheath connecting other parts.

623,521. Electric Meter. Thomas Duncan, Fort Wayne, Ind. Application filed January 19, 1898.

The armature, series and volt coils inductively actuate the armature, an impedance coil being in the shunt circuit with the volt coil; a secondary volt coil is inductively energized from the primary volt coil and co-operates therewith to produce a resultant flux acting on the armature, and a secondary impedance coil is inductively energized from the primary impedance coil and serves to reduce the retarding effect of the latter.

623,522. Electric Meter. Thomas Duncan, Fort Wayne, Ind. Application filed March 12, 1898.

A revoluble cylindrical armature, a series coil or coils in inductive relation to the armature, a secondary coil or coils wound coaxially with the series coils and receiving currents therefrom by conduction, a secondary field coil wound upon a multipolar iron core and arranged within the armature and energizing by conduction from the secondary, whereby a shifting magnetic field is established about the armature to actuate it, and a variable resistance in series with secondary coil or coils.

623,523. Electric Meter. Thomas Duncan, Fort Wayne, Ind. Application filed March 16, 1898.

A secondary coil receives its currents by induction from the series or main current, and this current differs in phase from the current in the series coil; a third coil is in coaxial relation to the secondary coil and adapted to receive its currents from the terminals of the series coil; a close revoluble armature is in inductive relation to the coils and adapted to be actuated thereby; a registering train is operatively connected with the armature; an ohmic resistance is in series with the third coil, and an inductive resistance in series with the secondary coil.

623,524. Electric Meter. Thomas Duncan, Fort Wayne, Ind. Application filed March 24, 1898.

The method described of obtaining a magnetic field in quadrature with the impressed or line electromotive force consists in setting up in a single coil a magnetic field that is the resultant of two currents of different time periods, both of the currents being supplied to the same coil, but derived from different sources, one being obtained from the supply mains and the other from the secondary of a transformer whose primary is connected to the supply mains.

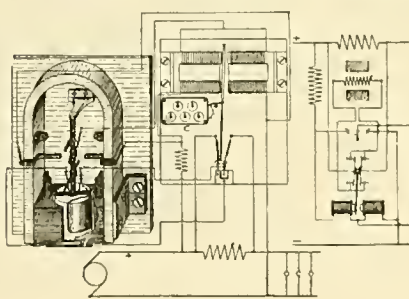
623,525. Electric Meter. Thomas Duncan, Fort Wayne, Ind. Application filed May 23, 1898.

The combination includes an induction-motor meter of a revoluble aluminum disk armature, means for retarding the revolutions of the armature, an unwound iron core having its lower surface parallel with and adjacent to the upper surface of the armature, means for varying the distance between the adjacent surfaces of the iron core

and the disk armature, an iron core adjacent to the lower surface of the disk armature, coils for magnetizing the iron core, a spindle and a suitable registering mechanism.

623,526. Phase Adjustment. Thomas Duncan, Fort Wayne, Ind. Application filed June 13, 1898.

As a means of producing a current lag of ninety degrees in an alternating circuit, an impedance coil is connected in the circuit, and a secondary impedance coil is connected in a separate circuit energized from the same source as the first impedance coil and inductively affecting the latter.



no. 623,547.

623,527. Electric Meter. Thomas Duncan, Fort Wayne, Ind. Application filed July 5, 1898.

In an induction-motor meter there is the combination of a revoluble metallic armature, a series field coil, a shunt field coil, an impedance coil in series with the shunt field coil, a magnetizing coil in co-operative relation with the impedance coil, a secondary coil supplying currents to the magnetizing coil, and a primary coil adapted to induce currents in the secondary.

623,528. Electric Motor. Thomas Duncan, Fort Wayne, Ind. Application filed August 6, 1898.

This is a motor for single-phase alternating currents with the combination of a plurality of poles. The coils are mounted upon one-half of the poles in diametric arrangement, the phase-lagging coils are in series with the coils and mounted upon the other half of the poles; a condenser is in series with the coils; the coils are mounted upon the same poles as the latter coils and in co-operative relation therewith, and a revoluble closed-circuit armature is arranged in inductive relation to the energizing coils.

623,529. Electric Meter. Thomas Duncan, Fort Wayne, Ind. Application filed August 8, 1898.

In an induction-motor meter there is the combination of a series coil, a volt coil having a portion of its turns wound in a reverse direction to the balance of its turns, a variable resistance shunted around the reversed portion of the volt coil; an impedance coil in series with the volt coil

and a revoluble metallic armature in inductive relation to the series and volt coils

623,530. Electric Meter. Thomas Duncan, Fort Wayne, Ind. Application filed August 13, 1898.

In an induction-motor meter the combination of a series coil, a volt coil, an impedance coil in series with the volt coil; an iron core upon which is mounted the impedance coil, and is provided with an adjustable portion, phase-changing coils wound upon the adjustable portion, an auxiliary coil in co-operative relation with the volt coil and receiving current from the phase-changing coils, an aluminum disk armature in inductive relation to the series, volt and auxiliary coils, a spindle carrying the armature, a registering train operated by the revolutions of the spindle and a permanent magnet.

623,531. Multiple-rate Electric Meter. Thomas Duncan, Fort Wayne, Ind. Application filed August 15, 1898.

A double-rate integrating meter comprises a motor, a registering train consisting of two worm wheels, an intermediate wheel and a driving wheel, a worm actuated by the motor and adapted for a co-operation with the registering train, and a double-coil electromagnet for causing either of the two worm wheels to form a meshing engagement with the worm.

623,532. Electric Meter. Thomas Duncan, Fort Wayne, Ind. Application filed October 17, 1898.

A cylindrical armature is employed with a series coil, in inductive relation to a portion of the periphery of the armature, a shunt coil, a second shunt coil in mutual inductive relation to the first shunt coil, a friction-compensating coil in series with the second shunt coil, a variable resistance in series with the friction-compensating coil and the second shunt coil, an impedance coil in series with the first shunt coil, the friction-compensating coil being arranged upon the opposite side of the cylindrical armature from the series coil to avoid mutual induction.

623,547. Ampere-hour Electric Meter. George Hummel, Munich, Germany. Application filed December 31, 1897.

A registering electric meter for continuous currents consists of the combination with the magnet having a constant field of a coil arranged in the constant field, means for supporting the coil to permit its oscillation therein, a damping bell also arranged in the field, a commutator controlling the circuits through the coil and means controlled by the coil for controlling the commutator.

623,570. Terminal Head for Electrical Conductors. Charles H. Sewall, Chicago, and Henry E. Procuier, Oak Park, Ill. Application filed September 29, 1897.

A strip or wire of fusible material with corrugated insulating material having alternate depressions on its edges adapted to support the strip or wire of fusible material and to interpose barriers between convolutions of the strip or wire.

623,570. Differential Electromagnet. John S. Stone, Boston, Mass. Application filed August 6, 1898.

An electromagnet or electromagnet coil having two

windings of different time constants connected in parallel in opposition to each other, and substantially without magnetic leakage between them.

623,583. Telephonic Trunk Circuit. Thomas C. Wales, Jr., Newton, and Henry M. Crane, Boston, Mass. Application filed September 29, 1898.

The reciprocally operated interswitchboard telephone trunk circuit described is provided with multiple switch connections upon the switchboards at both of its ends, a busy-test system adapted to establish a special and abnormal electrical condition as long as the trunk is switched at any one of its multiple connections, at either end thereof, and upon the switch sockets at all of the remaining switch connections of both switchboards.

623,607. Electric-lighting System. Ralph O. Hood, Danvers, Mass. Application filed February 3, 1897. Renewed March 17, 1899.

Provision is made for a constant-potential source of supply, an arc lamp, an incandescent lamp or lamps in series with the arc of the arc lamp, and a regulating magnet applied to the arc lamp having its coil or coils placed in a shunt circuit to the incandescent lamp or lamps.

623,610. Electric Third-rail System. Lowell M. Maxham, Boston, Mass. Application filed April 6, 1898.

In an electric third rail there is the combination of a normally dead rail formed of conducting material and made hollow throughout its length, a naked conductor extending longitudinally through the rail, fulcrumed arms supporting the conductor out of electric contact with the rail and extending through to the exterior of the latter, and means for automatically actuating the arms and moving the conductor into contact with the rail.

623,611. Combined Listening and Ringing Key for Telephone Switchboards. William O. Meissner, Chicago, Ill. Application filed January 4, 1899.

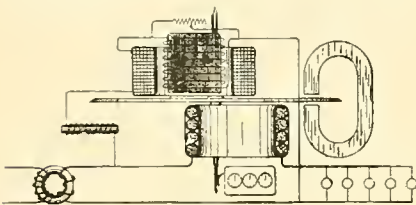
In a combined ringing and listening key there is a single lever, a head thereon and a sliding contact-maker member operated by the lever, together with contact strips operated by the head and sliding contact-maker member.

623,622. Electric-motor Regulation. Oscar H. Pieper and Alphonse F. Pieper, Rochester, N. Y. Application filed October 14, 1898.

The method of arresting the rotation of alternating-current shunt-wound electric motors consists in reversing the current through the armature and coupling the latter in series with the field.

623,623. Incandescent-lamp Base and Socket. Amund C. M. Prueker, Hanover, Germany. Application filed August 31, 1898.

An improved Edison socket-contact device is described comprising a threaded conducting socket, a terminal part at the extremity of the socket having a spiral, upwardly extending tongue, an exteriorly threaded base and a serrated contact part provided on the base with which the free end of tongue is adapted to engage and hold the base in the socket when it is screwed therein under compression of the spiral.



No. 623,529.

623,625. Electric Brake. Charles P. Pushaw, Washington, D. C. Application filed May 18, 1898.

Claim is made for the combination of brake levers, a plunger connected thereto, a solenoid in which the plunger is adapted to reciprocate, a wheel and axle, chains attached to the axle and to the plunger and running in opposite directions, and means for holding the wheel and axle in one of several possible adjusted positions.

623,637. Ship's Telegraph for Transmitting Signals, Orders, etc. Leon S. Thompson, Washington, D. C. Application filed February 23, 1898. Renewed October 1, 1898.

A receiver or indicator comprising a series of solenoids, an armature in the form of a core, to co-operate therewith, adapted to have its position relative to the series of solenoids changed by the energizing of the different solenoids of the series, and indicating means whose indications are produced by the energizing of the solenoids.

623,656. Portable Electric Lamp. Arthur Drescher, New York, N. Y. Application filed January 27, 1899.

A portable electric lamp, consisting of a flexible handle provided with a bore for the conducting wires, the handle being composed of a socket portion, a handle portion and a tapering end portion, a lamp socket to the socket portion, an incandescent electric lamp in the socket, a collar extending around the socket portion of the handle and a lamp guard attached to the collar.

623,659. Electric Belt. William H. I. Geiger, Denver, Colo. Application filed January 19, 1899.

One claim is made for the combination with the copper tubes the zinc rods, the absorbent member surrounding the rods and the insulating washer, with the coupling wires having a spring clamping clip at one end adapted to be manually sprung onto the body of the tube, and a pin or a spring clamp at the opposite end arranged to electrically connect with the zinc rod.

623,672. Railway Signal. John Jorgenson, San Francisco, Cal. Application filed December 22, 1898.

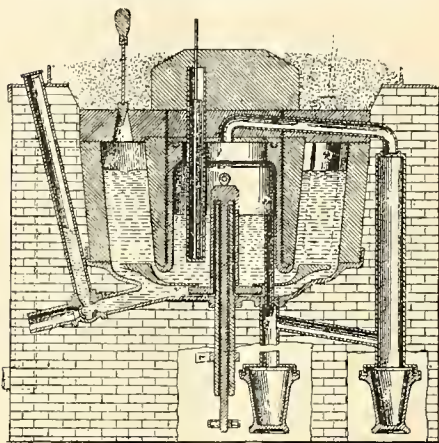
Signals and opaque concealing casings are disposed with relation to each other, globes, counterbalanced levers by which the globes are suspended and normally raised and within the casings, supplemental counterweights with which the armatures are connected and which normally set up in the levers, to retain the globes within the casings, and electromagnets, with means for energizing them whereby the armatures are attracted and the levers are first relieved of the counterweights and allowed to operate by gravitation.

623,678. Trolley Wheel. Chester B. Lebecher, Miles City, Mont. Application filed April 5, 1897.

A trolley circuit-controller consists of a main circuit-closer below the conductor and an auxiliary circuit-closer above the conductor, the latter adapted to change its contact from the upper to the under surface when encountering a cross wire, one maintaining the closed circuit while the other passes the cross-wire, whereby sparking is avoided.

623,689. Pneumatic Electric Safe or Vault Protection. Frank C. Smith, Delaware, Ohio. Application filed April 24, 1897.

Claim is made for an alarm and a safe or vault provided with a pressure chamber and a vacuum chamber, the walls of the chambers being constructed of an electrical conductor and being electrically connected with the alarm.



No. 623,691.

623,691. Process of and Apparatus for Manufacturing Alkali Metals. Charles E. Acker, East Orange, N. J. Application filed March 5, 1898.

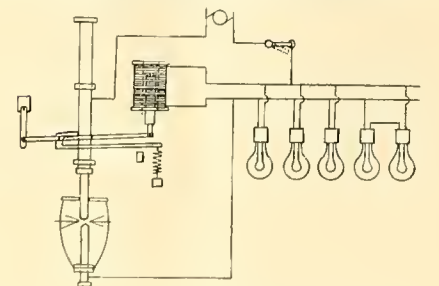
The process of reducing metals from their fused salts consists in subjecting the salts to the electrolytic action of an electric current in the presence of a molten metallic cathode with which the liberated metal is adapted to form an alloy, in imparting a forced circulation to the molten metal to conduct the alloy as formed to a separate chamber where it is permitted to stratify, and then volatilizing in an inert atmosphere in the chamber the metal thus liberated from its salt from an exposed surface of the cathode out of contact with the electrolyte, and collecting the volatilized metal.

623,692. Process of and Apparatus for Manufacturing Metallic Alloys. Charles E. Acker, East Orange, N. J. Application filed March 5, 1898.

The process of making an alloy of a heavy metal, such as lead, tin, zinc, etc., with a metal of an alkali or of an alkaline earth, consisting in reducing the heavy metal in a molten state, and employing it as a cathode electrolytically decomposing a fused salt of the metal of an alkali or of an alkaline earth, while superimposed upon the heavy metal, removing the resulting alloy from the region of the electrolyte, subsequently permitting its different portions to stratify, and flowing off the lighter portion from the surface.

623,702. Telephone Transmitter. Peter C. Burns, Chicago, Ill. Application filed January 12, 1899.

In a telephone transmitter a face plate or cover, bolts secured to and extended from the face plate, a solid back piece, having perforations therein through which the bolts pass, locking nuts on the bolts engaging against the solid back and holding it tightly and securely to the face plate or cover, a diaphragm held between the solid back and face plate by the means aforesaid, an inclosing shell having perforations therein, through which the bolts pass, and locking nuts on the bolts engaging against the shell and holding it securely and tightly about the back and in joined connection with the face plate or cover.



No. 623,607.

623,771. Distributing Terminal. Robert S. Donaldson, Pittsburg, Pa. Application filed August 1, 1898.

There is a central supporting stand with a series of inner cable terminal strips supported by and arranged radially around the same and a series of outer terminal strips supported by arms extending out therefrom.

623,730. Electric Incandescent Tube. William J. McCutcheon, Pittsburg, Pa. Application filed February 21, 1899.

An incandescent electric lamp is described comprising in combination a straight tubular glass body having its interior exhausted of air, and a filament arranged therein which connects at each end of the tube to a metallic conductor, a socket cap arranged upon one end of the tube, which has arranged thereon an insulated pin adapted to connect one of the filament conductors, an insulated cap arranged upon the opposite end and an insulated wire conductor connecting the lower end of the filament to the upper cap.

623,778. Electric Igniter for Explosive Engines. James H. Frew, Newcastle, Pa. Application filed October 2, 1897.

An electrode project into the explosion chamber; valves

are arranged in the chamber, means for operating a valve-actuating slide to automatically open and close the valves, and a contact pin pivotally supported on the slide and adapted to be brought into contact with and separated from the electrode to produce the igniting spark by the operating of the valve-actuating slide.

623,801. Combined Electric Arc Lamp and Fan. Joseph Melzer, Cleveland, Ohio. Application filed October 27, 1898.

An electric lamp comprises a solenoid, an armature therefor receiving a carbon, a clutch mechanism, a support for the armature limiting its downward movement, the support being vertically adjustable and having a longitudinal groove, and a platinum point engaging the screw and forming electrical connection.

623,811. Electrical Glow Light. Walther Nernst, Göttingen, Germany. Application filed October 2, 1897.

An improved electrical incandescent lamp consisting of a strip of material which is an insulator at ordinary temperatures and becomes a good conductor and luminescent at high temperatures, combined at its extremities with fixed terminals for conducting current through the same, and with a heat-producing structure separate from the luminescent and operating to raise all parts of the strip between the fixed terminals to a conducting temperature prior to the passage of the illuminating current.

623,820. Electrically Propelled Road Vehicle. Octave Patin, Puteaux, France. Application filed July 28, 1898.

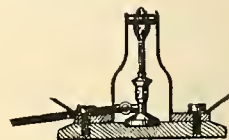
An electrically propelled road vehicle, the combination with the rear axle having a downwardly curved portion intermediately of its hollow ends, the driving shaft having its ends passed through the hollow ends of the rear axle, a motor supported on the depressed portion of the rear axle, the rear wheels mounted upon the ends of the driving shaft, and the band brakes or air brakes keyed on the wheel naves near the inner ends thereof.

623,821. Electrically Controlled Valve Gear for Gas or Other Motors. David W. Payne, Elmira, N. Y. Application filed March 25, 1898.

The combination with an electrically controlled valve gear of a commutator contact plate in circuit with the valve controller, a commutator brush also in circuit, one stationary and the other revoluble, and a centrifugal governor carrying the revoluble member, whereby the latter is made to traverse the stationary member and control the operation of the valve.

623,846. Printing Telegraph. David G. Smyth, Hartford, Conn. Application filed December 31, 1897.

The combination is claimed of a swinging body, means for holding the swinging body at either end of its movement, means for liberating such swinging body, a range of keys for making and breaking the electric circuit, a segmental range of printing types upon and moving with the swinging body, a presser for bringing the paper into contact with the printing type, and an electromagnet at the receiving station for bringing into action the presser, and a circuit-closer at the transmitting station moving with the swinging device for closing the circuit at the transmitting station in connection with the finger keys and effecting the printing at the receiving station.



No. 623,811.

623,887. Mechanical and Magnetic Amusement Game. Herbert Cottrell, Newark, N. J. Application filed January 17, 1899.

A magnet is provided with mechanism to cause it to rotate and to revolve around a common center, and a non-magnetic plate is arranged closely parallel to the plane of rotation of the magnets, having designations upon the face thereof, and an armature piece is intercepted from the magnet by the non-magnetic plate. When the mechanism is in motion the armature will be caused to glide over the face of the plate by the attraction of the magnets and in correspondence with the motion thereof.

623,888. Electro-deposition of Zinc upon Iron. Sheard O. Cowper-Coles, London, England. Application filed December 31, 1897.

The process of depositing zinc electrolytically and preventing the formation of zinc sponge by placing in an electrolytic cell containing suitable insoluble anode and cathode plates an electrolyte containing zinc sulphate and iron sulphate, and passing through the cell an electric current, the oxygen liberated at the anode when zinc is deposited preventing the formation of hydrogen compounds of zinc or zinc sponge.

623,906. Electric Actuating Mechanism for Station Indicators. Andrew Hunter, San Francisco, and Crest Gustafson, Oakland, Cal. Application filed July 26, 1897.

The combination is claimed of the stop wheel having slots in its rim, a stop lever, a spring detent on the stop lever, an electric motor having its armature shaft inserted into the stop wheel, a motor-actuating circuit including the stop lever, an auxiliary or branch circuit including a circuit-closing device and a relay adapted to act on the stop lever and raise it from the stop wheel, a spring latch adapted to engage and hold up the lever when that part is lifted by its relay, and projections on the stop wheel operated by the relative movement of the wheel to throw off the latch and release the stop lever.

623,908. Telephone Transmitter. Edward H. Johnson, Omaha, Neb. Application filed May 9, 1898.

A telephone transmitter comprising a diaphragm, a ring of resilient material bearing against the diaphragm, a series of contacts on the ring and another series of contacts with which the first-named contacts engage.

623,953. Electric Belt. Warren P. Freeman, New York, N. Y. Application filed September 13, 1898.

An electric belt is composed of a supporting strip and a series of elements of diverse character having enlarged ends and narrower connecting portions inserted in slots in the supporting strip and arranged with one plate or end of one element overlapping a plate or end of a diverse element on the opposite side of the supporting strip.

Western Electrician

EVERY SATURDAY.

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CHICAGO, MAY 13, 1899.

No. 19

Building a 2,100 Horse Power Generator.

In the new addition to the power house of the Metropolitan West Side Elevated Railroad company of Chicago two direct-connected generator units are building that will be somewhat larger than any other machines of like character in town. They are duplicates and consist of Allis vertical compound-condensing engines and General Electric 600-volt dynamos, and both engines and dynamos have the latest improvements that the experience of the builders has devised. In apparatus of this size it is, of course, impracticable for the manufacturers to deliver finished machines. The parts are made and assembled at the shops in Milwaukee and Schenectady, and then

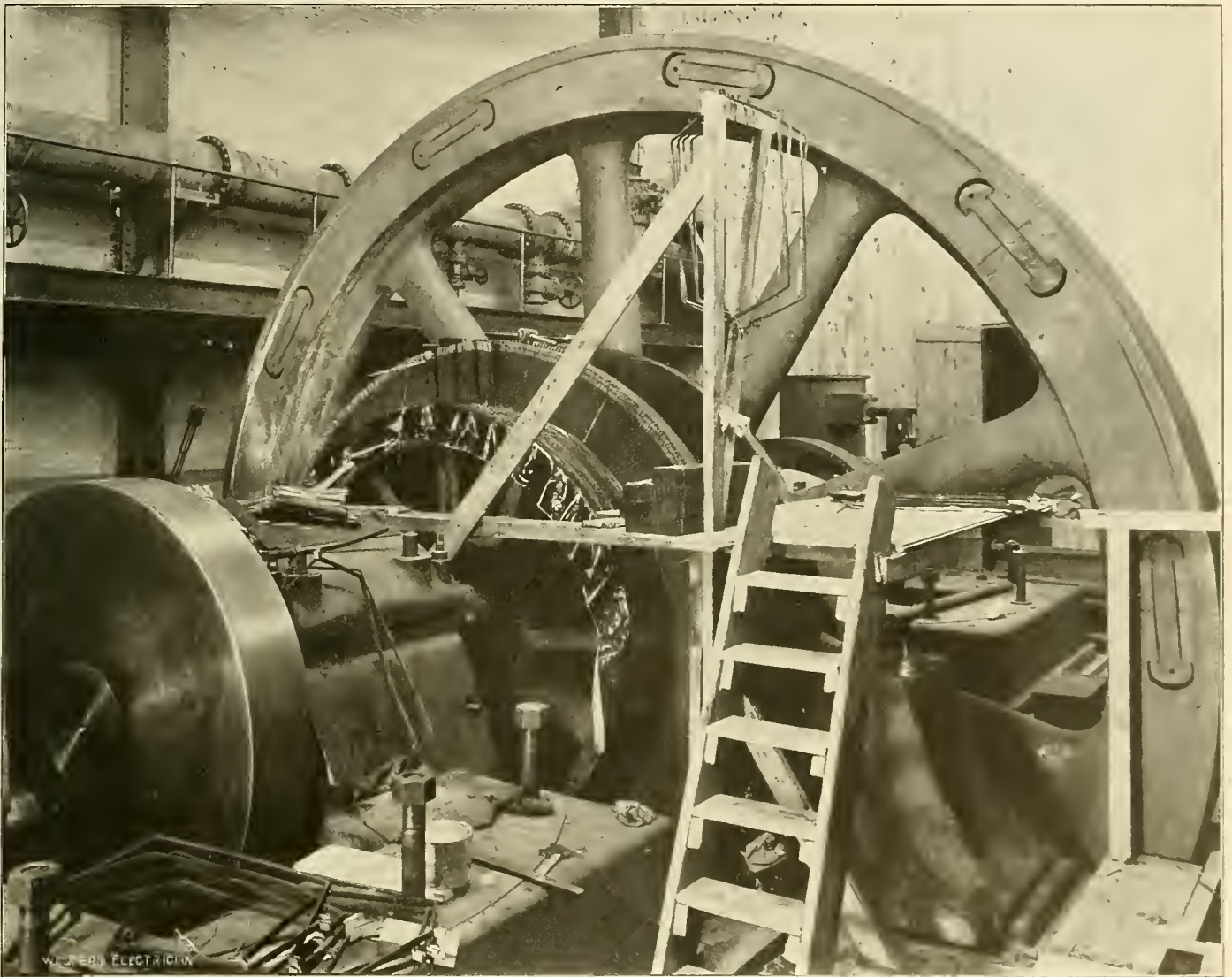
generator. Their dimensions are 38 by 76 by 48 inches. The floor space occupied by each generating set is 38 by 24 feet. The flywheel is 24½ feet in diameter and weighs 160,000 pounds in the rim. The shaft, with armature spider and disks, weighs 54 tons. The rating of each engine is 2,250 horse power at the economical rate of steam consumption, but, like the generator, the engine will stand an overload of 50 per cent. or even more. The engine will be operated at 75 revolutions a minute, and on a steam pressure of 165 pounds. It has two governors, one on each cylinder, and the valves for both high and low pressure cylinders are double-ported.

The generator has 18 poles and a nominal capacity of 1,600 kilowatts, with an electromotive force of 600 volts at full load. The armature is 10 feet in

room is left for a third of equal size. In the boiler-room six Babcock & Wilcox water-tube boilers of about 600 horse power each are being added to the plant. The older generating equipment consists of two 1,500-kilowatt machines and two of 800 kilowatts each. When the present addition is completed the station will have a generator capacity of 7,800 kilowatts. The additional machinery is needed badly, as during the morning and evening rush hours last winter the power house was sometimes overloaded 60 or 70 per cent.

New York Electrical Show Open.

On Monday evening the electrical exhibition in Madison Square Garden, New York, was formally



BUILDING A 2,100 HORSE POWER GENERATOR.

shipped piecemeal to Chicago for erection by skilled mechanics sent out for the purpose.

One of the generating sets is much further advanced toward completion than the other and will probably be in operation within six weeks' time. This is the one shown in the picture. The main shaft, with armature, flywheel and cranks disks, and the lower half of the magnet frame are in position. At the time the photograph was made the workmen had the task of placing the armature windings or bars well advanced. They worked on the rough platform shown, and the armature was turned for them by attaching to the flywheel a tackle from a traveling crane overhead.

The height of each engine above the floor level will be 31 feet, and the flywheel extends nine feet below it, so that the vertical dimension of the unit will be 40 feet. The cylinders are vertical, as stated, and will be placed on each side of the flywheel and

diameter, and the laminations are very thoroughly insulated from one another. The magnet frame is of cast-steel and strengthened by heavy ribs. Both engine and generator are strongly built, but they will be of graceful proportions nevertheless. They are, in fact, improved and enlarged editions of the power units in the older portion of the Metropolitan plant, which have a good record for steadiness and reliability.

Each of the new units has a jet condenser, which is an imposing piece of machinery in itself, standing 17 feet above the basement floor and having a steam cylinder 16 by 42 inches equipped with Reynolds-Corliss valve gear.

With the new extension the power house is about 600 feet long. The width is unchanged, about 150 feet. The building is divided into engine and boiler rooms by a longitudinal brick wall. In addition to the two 1,600-kilowatt generators now building,

opened. President McKinley and Governor Roosevelt sent congratulatory messages and Senator Dewey made a speech, in which he noted, with happy effect, that he had ridden from his house to the hall in an electric cab. The speaker also made a humorous reference to the possibilities of wireless telegraphy. The officers of the exhibition are: President, C. O. Baker, Jr.; vice-president, H. L. Shippy; secretary and treasurer, George F. Porter; executive committee, H. H. Harrison, L. F. Requa and Mr. Baker. Marcus Nathan is general manager and Luther Stieringer electrical engineer. The exhibition will remain open to the public until June 1d.

The Detroit and Lake Shore Electric Railway company is making surveys for an extension of the line from Lakeside to Marine City—a route that will, it is claimed, save 14 miles.

Automobiles in Paris.

By JOHN K. GOWDY.

On Easter Sunday the first installment of automobile cabs was placed at the disposal of the Parisian public. As soon as they issued from the depot at Aubervilliers, they were eagerly sought after, and gave most satisfactory results. The number of these vehicles is daily being increased, and the Compagnie Générale des Voitures expects, after a month's trial, to be in a position to judge of the convenience or drawbacks of the present type of cabs. Impressions of the wood cuts of the two types at present in use I inclose herewith. These vehicles are provided with accumulators, enabling them to travel from 60 to 80 kilometers (37 to 49 miles) without recharging the batteries.

The tariff varies according to the number of persons. For one or two passengers, the ordinary cab fare is applied, viz., 1.50 or two francs (28.0 or 38.6 cents) per hour; for three persons, two francs the journey, and four persons, 2.50 francs (48.2 cents). Between 12:30 and 6 a. m. the rate is 2.25 or 2.50 francs (43.4 or 48.2 cents) the journey and 2.50 to 2.75 francs (48.2 to 52.8 cents) per hour, according to the number of passengers. Fares beyond the fortifications will be 25 centimes (4.82 cents) above the existing rate for ordinary cabs.

The eventual adoption of automobiles for general use in Paris, as well as throughout France, seems to be a foregone conclusion; but there is no doubt that the tremendous speed at which private indi-

Foreign Trade Development.

[Prepared for the Western Electrician by the Philadelphia Commercial Museum.]

The apparent indisposition of American manufacturers to adopt the business usages and trading arrangements in vogue in foreign countries and their unwillingness to conform to these conditions and customs, in common with their European competitors, seriously retard the permanent establishment of American markets abroad. It may be added that some American manufacturers seriously injure the whole cause of American foreign trade by furnishing goods of a quality inferior to what was stipulated, thus raising a doubt as to the integrity of American business life and sowing distrust in the minds of buyers. It is idle to disguise the fact that, as a nation newly entering the markets of the world in competition with the seasoned salesmen of Europe, there is much to learn. The volume of foreign trade will largely be with the Far East, and therefore the following observations from a man who is well acquainted with the Asiatic markets will be found worthy of serious consideration:

The outlook for American trade in the East is most encouraging, as our products are much appreciated and sought after.

The splendid workmanship and finish to our products stimulate their sale and excite the admiration of all the oriental mercantile communities. With all these encouraging signs and opportunities to build up a big commercial trade with the world, which I see, if properly handled, would be second to none in a very few years, we, by laxity and thoughtlessness, are doing our best to turn it from our doors to our competitors by bad packing,

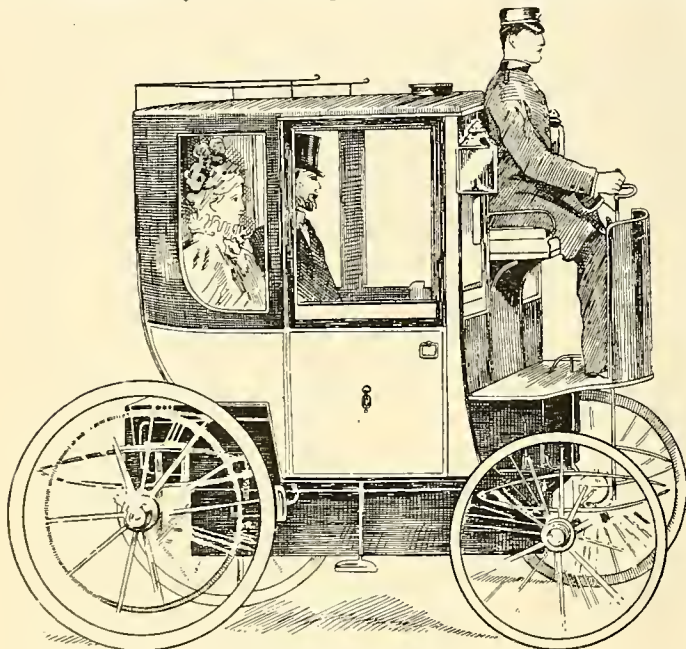
dealing with us to which we have been used by the manufacturers of other countries who have found out that transactions with us are to their advantage. As long as they do not think this worth while there is no use of trying to establish direct transactions with them.

Here is another comment on American deficiency, this time from Egypt, a country practically unknown to American manufacturers, but affording a great and improving market for their products, written by a correspondent at Alexandria:

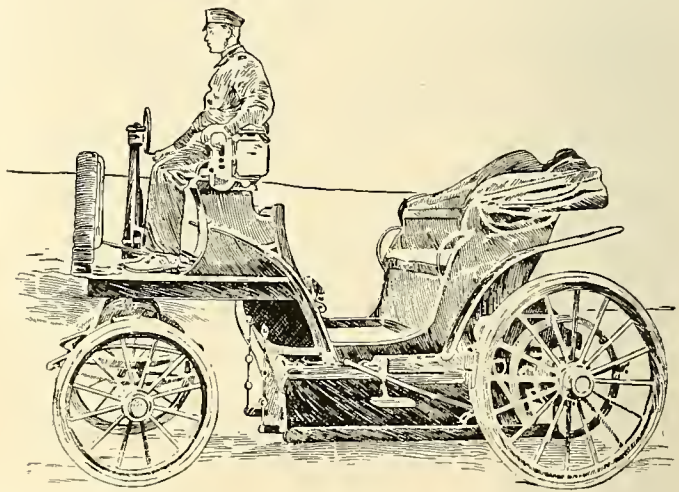
A good business might be done between Egypt and the United States, but to bring about this result American manufacturers must conform to the conditions prevailing in this market, and this is just what they will not do. Times without number letters are received from firms in the United States desirous of doing business with Egypt, and in practically nearly every instance nothing has resulted owing to their refusal to accept the conditions of sale in force in this country. They cannot expect buyers in Egypt to send to America for goods on terms which they have never complied with before when they can get the articles suitable for their customers from European houses that grant them the conditions of payment to which they are accustomed. No trouble is experienced in prevailing upon English and Continental manufacturers to do business on the terms ruling in Egypt, and surely there cannot be such a difference between their methods and those in force in America. In order to gain new markets American manufacturers must show enterprise and at the same time undertake a certain amount of risk, but so far they seem to be lacking in the first quality and quite unwilling to take even ordinary business risks, such as the four months' credit against acceptance granted here. The time and money which have been expended in endeavoring to bring about trade will be altogether wasted if American manufacturers do not show themselves more amenable to the conditions of the Egyptian market.

Taking another instance at haphazard from the correspondence on the subject, this is what a New Zealand trader writes:

Trade relations between this colony and the United States could be improved if mercantile companies and firms worked more in accordance with British methods in connection with business affairs. The British manufacturers grant much more liberal terms of credit than the Americans. It is unreasonable to expect representatives of United States firms to place new lines on this market to competition with goods of like nature from other countries and to sell practically for cash when the British manufacturers are willing to give long terms of credit. Then again American representatives frequently decline to supply samples, at any rate unless they are paid for. This is



Electric Brougham.



Electric Victoria.

AUTOMOBILES IN PARIS.

viduals with their motor-tricycles and other experimental automobiles dash about the streets has had a tendency to discourage the adoption of automobiles by those who would otherwise make purchases.

By daily observation in Paris, it is easy to see that improvements are constantly being made in doing away with the objectionable odors, excessive vibration and noise.

The action of the Compagnie Générale des Voitures in establishing the speed of its automobiles in the city at about eight kilometers (five miles) an hour will diminish, if not avoid, the crushing of pedestrians and serious accidents. The element of fear being eliminated, the introduction of reliable and not too complicated mechanism will certainly produce a new era in locomotion throughout France.

I may state that an important and appreciated merit in the new automobile cabs is the brake placed in the interior of the vehicle, by which the passenger can not only check the speed, but bring the conveyance to a standstill, independently of the conductor.

In order to have the trial complete and obtain the consensus of public opinion, registers are placed at each cab-stand for such observations as individuals may see fit to make.

Fort Wayne Electric Works.

Another change has been made in the name of the organization succeeding the defunct Fort Wayne Electric corporation. The company is to be known as the Fort Wayne Electric Works. The change is due to the fact that some years ago a local company was organized and incorporated under the name of the Fort Wayne Electric Manufacturing company, the name chosen for the reorganization. Inasmuch as the former charter has not expired, it was necessary to select another name. It is asserted that the Fort Wayne Electric Works will take an active part in supplying the electrical market under the direction of Messrs. Wood and Hunting. It is intimated that the scale of prices will be revised. The principal owner of the new company will be the General Electric company.

insufficient packages, illegible and incomplete marking, thereby losing our products on the foreign markets to an unmarketable condition.

My attention has been called daily to the condition of the European, British and American products landed in foreign ports, and I regret to say ours bears no comparison to the other two, either in packages, packages or marking.

Goods for the Orient should be well and securely packed in heavy, well-seasoned wood packages, equal to resisting the strain imposed by their contents, the rough handling they will receive and the many climatic changes they must pass through before reaching their destination.

They should be plainly and substantially marked with numbers, shipping mark and port of destination to insure correct delivery, and, part cularly, goods should be delivered alongside the ships in a more perfect condition than at present, and not with the reckless desire to get them out of hands regardless of future results.

The present mode of packing goods for exportation to far-off ports does not differ materially from that used for domestic shipment.

My experience of the East dates back to 1860, and from observation I know that once the confidence of the eastern merchant is obtained, especially the Chinese, our trade is a sured.

We have expectations of a large trade with Russia in most of our lines of manufactured products, but they will scarcely attain fulfillment if other importers have had occasion to form the same opinion of American business methods that caused a trader at Riga, on the Baltic side of the country, to write as follows. He has evidently formed a strong opinion on the subject, and his remarks are the more worthy of attention from the very earnestness with which he expresses himself:

I beg to say in a general way that after the experience I personally have had it is hardly worth the trouble of trying to introduce American manufactures into Russia.

I have bought some machinery from large American manufacturers, but it took a correspondence of many months before the goods were shipped, notwithstanding the fact that I did not ask for credit. Most of your manufacturers seem not to have the slightest idea about the manner business is transacted in this country, and therefore meet us with a suspicion unwarranted by facts and to which we do not need to submit. We can get all we want and on conditions suitable to us from Germany, France, Belgium and England, where they know our trade and have adapted their methods of dealing with us to the conditions of our trade. It takes months to have an order shipped from your side, while the European manufacturers fill them without delay.

For a whole year I have been in correspondence with a number of American firms, answered numberless inquiries, trying to introduce their goods in this country, but my experience has caused me to drop all efforts in this line.

If your manufacturers wish to have a share of the Russian business, they have, first of all, to make themselves acquainted with the conditions of our trade and to adopt the same methods in

a very short-sighted policy and very different from the method adopted by all British firms. Trade between the United States and New Zealand can be increased if free samples are furnished and favorable terms of credit are adopted in cotton piece goods, drapery, boots and shoes, bicycles and materials, hardware and ironmongery, canned fruits, etc.

And again, this time from a South African correspondent, a merchant at Pretoria, Transvaal:

As a matter of fact the great bulk of our manufacturers and would-be exporters are most supremely ignorant of the wants of the foreign markets, as well of the proper means of advancing and enhancing their foreign trade. It is a great misfortune that the idea has become prevalent in manufacturing circles in the United States that no commercial integrity exists outside of their own country and that it is absolutely unsafe to extend a line of credit to the foreign dealer, while as a matter of fact the secret of success of English, German, French and other European manufacturers lies in the assumption that other dealers than those close to their own doors are entitled to a line of credit of from thirty to ninety days after the receipt of the goods. It must be admitted that it is easier to handle the trade nearer home than at the other end of the earth, and so long as the manufacturer has sufficient trade at home to keep his works in operation he had better stay at home. But when he goes into the world for a market for his surplus product he should make up his mind that he must meet competition in prices as well as in terms, and not let him so make up his mind he had better not waste time and money in trying to enter foreign markets.

Very much the same commentaries on American methods reach the Philadelphia Commercial Museum from the South American countries and Mexico. A correspondent in the City of Mexico who was asked to state his opinion of the commercial standing of the United States in Mexico expresses himself in the following blunt manner:

Mexico imports from the United States only such articles as it cannot obtain from Europe. When it is possible to obtain similar articles from Europe it prefers them; first, because they are cheaper; second, because they are better packed; third, because European exporters accord more facilities for payment; fourth, the money exchange is not so high; fifth, our buyers can explain to the European sellers all the particulars which they desire because the European houses all correspond in Spanish, and also constantly send traveling agents with samples who take good note of all our requirements.

The advantages which are offered by the United States markets are the proximity and the promptness with which the orders can be executed, but when it is a question of orders sent in advance these advantages are of no consequence.

As to your packing, an important matter to the importer, I must say that the North American packing is the worst that is known. Its faults are the following: The merchandise is not sufficiently well arranged inside the boxes, which generally contain voids or empty places filled with sawdust or excelsior. The cases should be well made to measure and the goods well arranged. The wood in the cases is too thick, heavy and rough,

all of which is prejudicial on account of the freights as well as on account of the custom dues and the poor condition of the merchandise.

This concurrence of opinion regarding the shortcomings of American manufacturers in their foreign relations is too marked to leave room for doubt that the requisites for successfully prosecuting trade with foreign peoples are not understood in this country. The matter is of the supremest consequence and demands most careful consideration at the hands of American manufacturers.

Electric-railway Building in Mexico.

The illustration, which is reproduced from Modern Mexico, shows that work is progressing gradually on the task of building an electric street-railway system in the streets of the City of Mexico. Evidently there is no distressing hurry about the job at the track crossing shown in the picture, but no doubt in good time everything will be finished satisfactorily. Indeed, it is said that the power plant is all in place and that the track is down for almost the entire length of the first line to be equipped—that from San Angel to Guadalupe. It is believed that the system will be ready for use for the first time on Mexico's Independence Day, September 16th.

Animal power has heretofore been used for the street-railway system of the City of Mexico, which is quite extensive. For suburban service steam dummy engines are used, and these will probably be retained for freight and express service. Fares are five and six cents in the city, but some of the suburban fares are as high as 30 cents.

National Electric Light Association.

In pursuance of the alternative arrangement between New York and Chicago, this is New York's year for the convention of the National Electric Light association. The gathering will be held at Madison Square Garden, with headquarters at the Murray Hill Hotel, on May 23d, 24th and 25th. The electrical exhibition at Madison Square Garden, given under the auspices of the association, is now open, and will be continued until June 3d. The General Electric company has invited members of the association to visit the Schenectady factories and has arranged for a special train on the New



ELECTRIC-RAILWAY BUILDING IN MEXICO.

York Central railroad. The round trip from New York is planned for May 26th.

Papers on the following-named subjects will be read and discussed: "Single-phase Distribution," Herbert A. Wagner, St. Louis; "Underground Electrical Construction," Louis A. Ferguson, Chicago; "Some Notes on Underground Distribution of Two-phase Current in New York City," E. A. Leslic, New York city; "The Development of High-tension Service" (illustrated by stereopticon), Calvin W. Rice; "A Local Transmission System—Development and Operation," W. S. Barstow, Brooklyn; "Alternating-current Generation and Distribution—Changes Contemplated in Atlanta," H. M. Atkinson, Atlanta; "Means of Affording Safety in Electrical Distribution," W. L. R. Emmet, Schenectady; "Rotary Transformers and Storage Batteries, and Their Relation to Long-distance Transmission," Professor W. L. Robb, Hartford, Conn. The discussion on transformers will be led by Professor Goldsborough of Purdue University, Lafayette, Ind.

The committee of the association appointed to effect some readjustment of the freight classifica-

chairman that 'the committee do not permit oral argument before them in support of application for changes in classification of the various commodities.'

It is the desire of the committee of the National Electric Light association that all manufacturers and others interested in tariff changes have someone present at the convention at New York who will meet with the committee, with the idea of taking some vigorous steps calculated to bring about a just and equitable tariff. It is apparent, and has been for some time, that ordinary appeals to the railroad organization, as represented by their classification committee, will prove inadequate to accomplish the desired end. An announcement will be made on the opening day of the convention of a time and place for a special meeting to be held with the committee on this particular subject. During the session of the convention, that steps may be taken other than the usual resolutions that follow a committee's report. "Every central station in any large city, or any considerable user of electrical apparatus, as well as every electrical manufacturer of heavy machinery and electric lamps," says the committee, "should be sufficiently interested in this subject to have some one in attendance at the convention to advise with the committee in carrying out the object for which it was created."

The members of the committee are W. C. Bryant, George W. Davenport and James I. Ayer, chairman.

Southwestern Electrical Men at Austin Next Week.

The annual convention of the Southwestern Gas, Electric and Street-railway association will be held at Austin, Texas, May 17th to 19th. The following list of papers has been prepared: "The Item of Depreciation," by W. E. Hamilton, Shreveport, La.; "Meters," by W. E. Holmes, Austin, Texas; "Transformers," by H. L. Monroe, Dallas, Texas; "The Amount and Extent of Legitimate Investment in Electric-lighting Plants of Certain Capacities," by F. Fries, San Antonio, Texas; "Summer Amusements for Street-railway Companies," by T. H. Stuart, Waco, Texas; "Art and Science of Selling Gas," by T. D. Miller, Dallas, Texas; "A Model Plant Under Model Management; What Both Should be Like," by J. F. Strickland, Waxahachie, Texas; "Alternators," by E. Dysterud, Monterey, Mexico; "The Attitude of a Corporation to the Public," by W. H. Weiss, San Antonio, Texas; "Means for Encouraging the Diversified Use of Electric Current," by C. L. Wakefield, Dallas, Texas; "Electric Lighting and Application of Electricity to Various Purposes in Mexico," by a Mexican delegate; "Arc Lamps," by Max Levy, Galveston, Texas.

An attractive programme of social features has been arranged. The headquarters of the association will be at the Driskill Hotel. In connection with the convention the Commercial Club of Austin has arranged to hold an electrical exposition that will be attended, not only by members of the association, but by citizens generally. E. L. Wells, Jr., of Marshall, Texas, is the secretary of the association.

Electric-railway Consolidation in New England.

[Correspondence of the Western Electrician.]

Boston, May 6.—The syndicate represented by F. Rollins Morse & Bro. and Tucker, Anthony & Co., previously referred to in the Western Electrician as promoters of a consolidation scheme for Eastern New England, are said to hold for the purpose now nearly all the coast lines of electric street railways between Newport, R. I. and Nashua, N. H., with the exception of the Boston Elevated company's plant. The railways thus absorbed number upward of a score, and comprise about 700 miles of track, built or under charter. The estimated gross receipts therefrom are \$4,000,000 annually, and it is proposed to issue \$11,000,000 preferred four per cent. cumulative stock and \$11,000,000 common stock. The underwriting has been largely oversubscribed, and the stock has been taken largely by persons heretofore interested in the various properties to be consolidated. It is officially denied that the syndicate intends eventually to absorb the Boston elevated railway. There is an understanding, however, it is conceded, between the two big factors in the railway situation, and they will work in harmony wherever they come into close contact. The principal lines in the deal are the Lynn and Boston, entering the city from the north by way of Chelsea and Charlestown and having subway rental rights, the Quincy and Boston, touching the city boundary on the south by way of Neponset, the Lowell, Lawrence and Haverhill, the Gloucester, Taunton and Providence, the Bridgewater, Taunton and Brockton, Dighton, Somerset and Swansea, Newport and Fall River, and the Newport Illuminating company, which controls the Newport roads.

Storage-battery Litigation.

In the United States Circuit Court at Boston, on May 5th, Judge Colt granted an injunction upon the application of the Electric Storage Battery company, restraining the Hatch Storage Battery company from the alleged infringement of patent upon an improvement in secondary battery and in the process for making the same. The Brush patent issued in March, 1880, is the one said to have been infringed.

Lightning Flash in South Dakota.

Photographs of lightning flashes have been taken in several instances, but seldom is such a clear, well-defined picture secured as that herewith reproduced. The negative was made by Mr. W. C. Gibbon, at Tripp, S. D., at 10 p. m. on July 22, 1898, during a hailstorm. The buildings shown are on Main street in Tripp. The direct ground connection is exceptionally heavy and well marked, while the forked branches of the discharge also show clearly. The one at the extreme left increases in brightness as it proceeds from the main path of the disturbance and ends abruptly in a peculiar manner. It is said that the Weather Bureau at Washington has pronounced this photograph the best picture of a lightning flash in its collection. The picture is copyrighted and is reproduced in the Western Electrician by the courtesy of Mr. Gibbon.

Probable Consolidation of North and West Chicago Street Railways.

It seems probable that the North Chicago Street Railroad company, the West Chicago Street Rail-



LIGHTNING FLASH IN SOUTH DAKOTA.

road company and the Consolidated Traction company, now controlled by Mr. C. T. Yerkes, will pass into the hands of the group of eastern financiers known as the "Whitney syndicate." If the pending negotiations are successfully concluded, the three companies mentioned will be merged into one and Mr. Yerkes will retire from the management. It is said that none of the elevated roads is included in the present negotiations. Neither is the Chicago City company, although the stockholders of the South Side system are naturally watching the movement with interest.

tion on electrical merchandise has received at the hands of the official classification committee of the railroad companies, C. E. Gill, chairman, a letter from which the following is an extract: "I have to advise that the subject was presented to the classification committee for consideration, but after careful deliberation the committee did not deem it expedient to recommend any change in the classification of this class of property." A member of the committee requested the privilege of personally representing the interests of shippers and those engaged in the electrical trades, in support of the suggested changes in classification, but was informed by the

DEVELOPMENT OF THE TELEPHONE FIELD.

Proposed Method of Telephoning without Connecting Wires.

The fascinating problem of transmitting articulate speech without the use of conducting wires is naturally connected, in the minds of engineers, with the wireless-telegraphy experiments that are now making in various quarters of the world. It is, of course, a much more complicated task to affect the coherer of the Marconi system by the undulatory waves of speech transmission than by the sharp, distinct signals of the Morse alphabet. It is necessary to decohere the particles in the coherer with a rapidity greater than the impulses of the speech-transmitting waves, as, if the particles be cohered but for an instant longer than necessary to transmit a Hertzian wave impulse, the next impulse would not affect the already cohered particles, and the speech would be broken and indistinct.

To attain this essential development in wireless telephony, Mr. J. J. O'Connell, of the engineering staff of the Chicago Telephone company, who has given the subject considerable attention, proposes the receiving station represented diagrammatically by the accompanying drawing. The diagram shows a Wehnelt electrolytic interrupter, operated by a battery and connected to a mechanical oscillator which serves to decohere the filings in the coherer at the rate desired. The plan is to operate a mechanical oscillator by means of a current interrupted by the liquid circuit-breaker. This will decohere the coherer so rapidly that it will be possible to keep up to or ahead of the telephonic vibration, which will be produced by a spark coil at the distant transmit-

Telephone News from the Northwest.

(From the Minneapolis correspondent of the Western Electrician.)

Fire in the roof of the First National Bank building, Duluth, ruined the exchange of the Duluth Telephone company, the loss being about \$25,000. New equipment was ordered at once, but the town will be without service for at least two weeks. Connection will be made with Superior and messengers sent for parties within reasonable distance without charge.

The Central Telephone company has installed a small exchange at Pomeroy, Ia.

T. W. Stone is installing a telephone exchange at Benson, Minn.

There is a possibility that telephone companies in Iowa will escape taxation in all counties except Polk, where the county officials have taxed them. The state is somewhat embarrassed, as the action of the Polk county officials raises the question as to the right of the local boards to tax them.

The Wright County Telephone company's application for a franchise at Clarion, Ia., was defeated.

The Iowa Telephone company will establish a telephone exchange at Ida Grove, Ia.

The A. W. Chamberlin Telephone company of Stratford, Ia., contemplates building a toll line from

have been made by the local agent. The doctor then assumed there was an intention to keep him from having night connection and made a public remonstrance.

The Fairmont Telephone company contemplates a telephone exchange at Heron Lake, Minn.

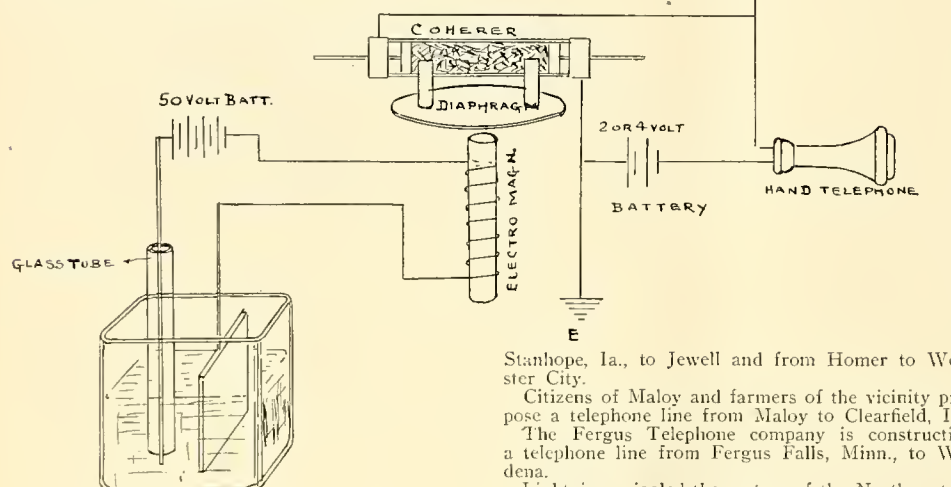
The St. Paul Board of Assembly granted a franchise to the American Telephone and Telegraph company, but amended it by making it void if the company discriminated against any applicants.

Principal Stockholders of the American Bell Telephone Company.

(From the Boston News Bureau.)

The following table gives the holders of 500 shares or over of stock of the American Bell Telephone company on March 31, 1899, compared with holdings of four previous years:

Holders.	1899.	1898.	1897.	1896.	1895.
Agassiz, Alex.	573	573	521	475	459
Akin, Albert J.	825	1,250	1,000	525	480
Ayer, Fred	878	878	798	725	851
Barbour, Ed. D.	532	532	532	532	777
Bell, Mabel G.	1,000	1,064	1,064	1,064	1,064
Bigelow, John	500	500	510	532	532
Blake Bros. & Co.	1,431	2,138	1,947	2,214	1,703
Blake, Anna S. C.	729	729	729	729	729
Blake, Arthur West (est.)	1,150	1,465	1,465	1,870	2,264
Blake, Francis	700	700	700	824	824
Blake, Francis, tr.	745	743	743	747	745
Bowditch, Em. W.	452	647	904	800	800
Bowditch, James H.	1,100	1,050	1,050	1,000	955
Brooks, J. Henry	500	500	500	295	295
Cabot, Susan B.	810	810	737	670	638
Converse, E. S.	1,000	582	212	100	..
Curtis & Motley	150	767	52	175	102
Childs, Wm. A.	629	629	572	572	572
Cochrane, Alex. & Co.	1,070	1,200	1,125	1,500	1,500
Coolidge, T. Jefferson	642	642	402	202	202
Cotton, Wm. C.	1,050	1,050	946	860	829
Crane, W. Murray	4,122	4,122	3,520	3,200	3,000
Crane, Zenas	4,000	3,420	3,100	2,800	2,400
Crane, Fred G.	660	660	600	518	300
Estabrook & Co.	1,108	..	..	..	..
Fay, Jos. S., Jr.	1,050	1,058	1,000	1,100	1,023
Flagg, Augustus	500	550	550	500	..
Forbes, J. Malcolm	500	1,038	1,732	1,721	1,436
Forbes, Wm. H. (est.)	17	1,312	1,940	3,329	3,277
Forbes, Edith E., tr.	250	..	..	..	..
Forbes, Ralph E., per & tr.	375	..	..	..	..
Foss, E. N.	600	600	600	600	562
Graham, John M.	650	650	50	..	..
Gray, Horace	1,025	725	725	639	529
Grew, Edw. S.	1,000	1,000	1,000	1,000	1,000
Grew, Henry S.	670	670	670	600	600
Grew, Jane N.	880	880	880	800	800
Gardner, Geo. P., tr.	500	..	..	..	..
Hubbard, Gardner G. (est.)	500	690	690	887	690
International Trust Co.	650	650	100	..	..
Jackson & Curtis	874	1,299	1,850	2,209	2,883
Jacques, Kate S.	550	550	500	500	500
Lee, Higginson & Co.	674	936	507	810	..
Lowell, Augustus	1,540	1,540	1,400	1,200	815
Lowell, Percival	1,696	1,696	1,596	1,450	1,250
Lynn, Arthur T., tr.	790	990	990	900	900
Minor, Wm.	308	797	541	267	39
Minor, Wm., Jr., tr.	185	732	730	672	682
Morgan, J. P. & Co.	1,325	1,725	2,996	2,675	..
Morse, E. Rollins & Bro.	832	..	..	..	..
Norman, Geo. H.	600	600	500	500	500
Parker, Messes G.	774	774	700	610	583
Peabody, Geo. A.	840	840	840	840	810
Pickman, Dudley L., p & tr.	500	950	950	1,000	950
Pollok, Anthony (est.)	769	659	609	636	..
Prescott, Eliza C.	985	935	825	724	624
Plummer, George A. (est.)	500	500	100	5	5
Scull, Gideon	717	717	717	717	717
Sewall, Richard B.	562	562	562	562	562
Sewall, William B.	734	734	734	734	700
Spaulding, M. D. & J. P.	500	500	500	500	500
Stanley, Frank E., tr.	1,807	1,807	1,642	1,642	1,642
Thomas, Wash. B.	550	550	550	500	500
Tower, Giddings & Co.	558	1,112	560	205	10
Tuckerman, L. S., tr.	504	504	504	502	500
Vail, Theo. N.	4,384	4,784	4,804	..	..
Vermilye & Co.	747	..	..	..	..
Watson, Thomas A.	1,610	1,610	1,610	1,610	1,610
White, Chas. B.	124	124	559	558	463
White, W. A. & A. M.	832	780	545	300	100
Williams, Chas., Jr.	550	550	550	550	550
Wilkins, Walter P.	..	550	..	..	..
Wright, Esther F.	1,511	1,410	1,200	1,036	926
Wright, Mary E.	1,000	875	710	566	452
Wainwright, H. C. & Co.	871	..	..	..	..



PROPOSED METHOD OF TELEPHONING WITHOUT CONNECTING WIRES.

ling station operated by a battery and a solid-back transmitter.

About a year ago Mr. O'Connell tried to telephone without wires, using the coherer, tapped by a vibrating hammer, to receive the speech waves, but the articulation was poor, owing to the slow method of decohering. He has since devised the plan shown by the drawing, and he and other telephone engineers with whom he has discussed the subject hope that it will form the foundation for a successful system. A practical test will soon be made in Chicago, and it is awaited with much interest.

Parrot and Telephone.

(From the Chicago Daily News.)

An antiquated green parrot, the possession of a young suburban miss, is chuckling over his almost successful attempt to break an engagement. Poll's cage is situated near the telephone, and ever since his advent he has regarded it as an "esteemed contemporary." He never fails to say "hello" vehemently a great many times whenever the bell rings.

Ye yesterday morning the young lady wanted to call her fiancé at his place of business on a "very important matter." Of course he came instantly to the phone. Poll had heard the telephone bell ring, and, waddling over to the other side of the bar, looked curiously out at his young mistress.

"Hello, Harry, I wanted—" she began. "Hello, hello, hello, hel-lo," screamed Poll. "Hello, hello, hello," the young lady began again, but again the stream of "hel-lo's" poured forth. Without turning from the phone, but addressing the parrot, she cried, angrily: "Get up! Get up! Oh, no, I didn't mean you!" "Through the phone—" I was talking to this provoking bird!"

It is understood that he forgave her.

The Manchester, England, City Council has decided to send a deputation to the postmaster general supporting the application of the Mutual Telephone company for a license.

Stanhope, Ia., to Jewell and from Homer to Webster City.

Citizens of Maloy and farmers of the vicinity propose a telephone line from Maloy to Clearfield, Ia.

The Fergus Telephone company is constructing a telephone line from Fergus Falls, Minn., to Wadena.

Lightning crippled the system of the Northwestern Telephone company at Oshkosh, Wis. Two lead cables were affected.

The Standard Telephone company, which has numerous toll lines in Southeastern Minnesota, is heading toward Mankato, Minn. The Southwestern Minnesota Telephone company, which covers the southwestern part of the state, is also preparing to build to Mankato.

The Minnesota Electric company of Minneapolis is installing a telephone exchange at Alexandria, Minn., for the Park Region Telephone company.

The Fairmont Telephone company contemplates putting in an exchange at Madelia, Minn.

The Iowa and Nebraska Telephone company is an applicant for a franchise at Sioux Rapids, Ia., and will put in an exchange and a toll line through to Storm Lake and Spencer.

Humboldt, Ia., will vote May 26th on granting a telephone franchise to the Iowa Telephone company, or to the Humboldt Electric Lighting and Power company.

The Hanamo Telephone company will extend its lines from Hopkins to Bedford and Corning, Ia., and an exchange will be put in at Bedford.

Telephone toll rates in Northwestern Iowa and Northeastern Nebraska have been reduced in some instances to one-fourth their former amount, as a result of competition.

The telephone exchange at Anamosa, Ia., has been moved to new quarters and new equipment has been put in use.

A. W. Dieckhoff and H. Jaehnings of New Richmond, Minn., are soliciting subscribers in Sleepy Eye, Minn., with a view to establishing a telephone exchange there.

The People's Telephone company of Waupun, Wis., will build a line from Waupun to Randolph.

The Northwestern Telephone Exchange company is extending its wires to Rollingstone, Minn.

Telephone connection between Gilman and Dunbar, Ia., is projected.

Dr. Gammel of Madison, Minn., announces to the public that hereafter, "owing to the unjust discrimination of the telephone company" against his patrons and himself, all communication with him must be by telegraph. The telephone company presents an explanation of the difficulty. The company says that Dr. Gammel wanted to have the switch turned to his line when the central office closed at night. The company replied it would be all right if it did not conflict with a previous arrangement which might

A feature of the list is the general reduction of holdings by trustees and the division of stock by the William H. Forbes estate. The Forbes family holds 2,536 shares of stock.

Theodore N. Vail still remains the largest stockholder, with 4,384 shares, a reduction of 400 shares from his 1898 holdings. W. Murray Crane is the second largest stockholder, with 4,122 shares. The holdings of J. P. Morgan & Co. have been reduced 400 shares during the year to 1,325 shares. In 1897 J. P. Morgan & Co. held 2,996 shares.

The 13 directors this year hold 3,731 shares, compared with 4,394 shares in 1898, 5,651 shares in 1897 and 7,770 shares in 1896. Under Massachusetts law it is not necessary that directors hold any stock in a corporation which they direct, but stock stands in the names of the present directors, as follows:

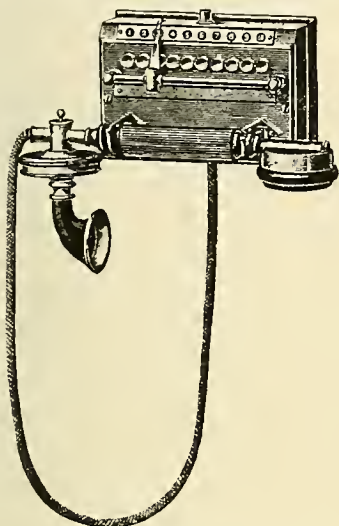
	1899.	1898.	1897.	1896.	1895.
Francis Blake	700	700	700	824	824
Alex. Cochrane (& Co.)	1,070	1,200	1,115	1,500	1,500
Henry S. Howe	124	124	110	110	110
Chas. Eustis Hubbard	477	477	477	477	477
Jno. E. Hudson (president)	15	15	15	15	15
Charles E. Perkins	400	400	385	450	450
Thomas Sanders	12	12	12	12	12
Messes Williams, tr.	226	226	192	155	5
C. W. Anory	100	100	110	10	10
George L. Bradley	..	..	..	..	..
T. Jefferson Coolidge, Jr.	110	110	100	..	..
J. Malcolm Forbes	500	1,033	1,732	1,721	1,496
Thos. B. Bailey	..	..	..	..	..

The Bennettsville (S. C.) telephone system has been sold to E. L. Moore of Dillon, S. C., owner of the Dillon exchange, who will extend the line through Cheraw to Chesterfield Court House, and open exchanges at those points.

Private Telephones.

The use of the telephone in large factories and similar establishments in England has not become general and the advantages of an intercommunicating system is not fully appreciated. The London Electrical Review says: "There are thousands upon thousands of warehouses in this country, we imagine, which have no up-to-date method of communicating from department to department or from room to room, and it is sometimes hinted that the trade does not push the business thoroughly and bring it before the attention of likely users. Those who have tried proper methods appreciate the advantages which they carry in their train, and they would not care to relinquish their use. Various firms have for many years been doing their best to improve private telephone apparatus, and have thus brought it to the high degree of perfection which characterizes it to-day, when the fitting-up is properly done." The accompanying illustration represents a telephone set that is now being generally introduced for this class of work. It is known in England as the "Handcom," and resembles in general features the apparatus produced by American makers for the same purposes, though it must be admitted that the cut conveys the impression that the English make is more cumbersome than the present standard American style.

The instrument is handy, however, as it can be fitted to almost any position, this being largely due to the fact that the automatic switching hook of the ordinary form of telephone is entirely dispensed with, so that the hand combination can be suspended or



PRIVATE TELEPHONE.

laid down in any position that may be convenient. The switching arrangement for disconnecting the bell and closing the telephone and microphone circuits is contained in the handle of the hand combination, and takes the form of a lever which has to be kept pressed whilst using the instrument. Inside the containing case is the induction coil, call buzzer and the necessary connecting terminals. The number labels are arranged so that they can be adjusted to read in any direction, according to the position in which the instrument is fixed. As the wires leading into the instrument may come from any direction, it is not possible to make a hard-and-fast provision for their entrance to the interior of the instrument. Provision is therefore made for an entrance on each side and one at the bottom of the case. These entrances are closed by a small nickeled plate, and all that is necessary is to remove the plate from the side at which it is required to enter. The "Handcom" set is made for wall, desk and other use.

Municipal Ownership.

"Taking the case of the telephone as an illustration," says the New York Times, "it would be an abuse of the taxing power and an act of flagrant misgovernment to take the money of 3,000,000 people who never use a telephone to pay the cost of maintaining a system of telephones for the benefit of the other half million who do use it. But our correspondent replies that the operation of a telephone system would be very profitable and the city would make money. That is not the usual result of city ownership. But the argument is worthless even if the assumption of profit is correct. The city ought not to go into business to make money. That is not one of the functions of a city government. If the business is profitable it ought to be left to engage the energies and reward the industry of the private citizen. Any other theory is socialistic and pestiferous."

Another view of the subject is presented in the accompanying cartoon from the New York World which was inspired by the revelations of the Mazet committee of inquiry into the affairs of the city government.

The Chattanooga Chamber of Commerce will secure long-distance telephone connection for that city with Atlanta and North Georgia towns.

Wireless Telephony.

In an endeavor to adapt—even on paper—the principles of "wireless telegraphy" to the sister service, telephony, the first essential divergence of the two systems of communication, telegraphy and telephony, presents itself at once as an obstacle for manipulation. In telephony there must be nowhere in the chain of conversions any gross mechanical agency, such as a relay or the contact breaker of a sparking coil, these and kindred devices being much too ponderous and inert to convey the rapid pulsations of a telephonic message.

The nearest approach to a purely mechanical link in the system is the carbon transmitter in all its many modifications—Blake, Hunnings, etc.

I have endeavored to include these two types (slightly modified) in an arrangement which, if experimented with and developed, would perhaps

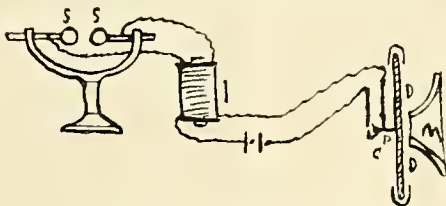


FIG. 1. WIRELESS TELEPHONY.—TRANSMITTER.

evolve into a workable system of wireless telephony for moderately short distances.

Briefly, the sparking coil of wireless telegraphy is replaced by an induction coil (I), Fig. 1, whose primary circuit receives its pulsations from an ordinary Blake transmitter when spoken into at the mouthpiece (M). This coil, in order to produce sufficiently long sparks, would require to be much more highly wound than the little coil found in the transmitter of an ordinary telephone instrument.

Its secondary circuit is open, the two ends terminating in brass spheres (SS), or, if these proved to have too great an electric capacity to admit of such rapid alternation, merely in two points.

As regards the length of the spark gap, that is determined by the distance over which the message is to travel to the receiving station. That is all that is comprised in the transmitting apparatus illustrated in Fig. 1.

The receiving apparatus is illustrated in Fig. 2. The two wings (WW) receive the pulsations, but instead of being connected to the coherer of wireless telegraphy, their connecting wires are attached to the two diaphragms (DD) arranged as in the Hunnings transmitter, the interspace being filled with granules of carbon or silver, etc., as experiment might direct. These diaphragms and the granules are included in circuit with a battery, and the coils (MM), which are placed on the arms of a magnet whose poles are in position behind the diaphragm (D), as in the manner of an ordinary telephone receiver. This diaphragm has, however, on the other side of it, the platinum bead and carbon button of a Blake transmitter, and this arrangement serves as a relay, so to speak, to intensify the vibration

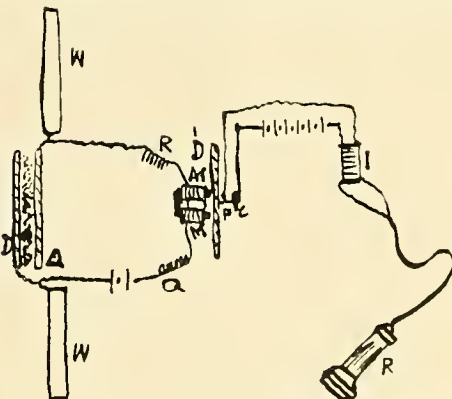


FIG. 2. WIRELESS TELEPHONY.—RECEIVING APPARATUS.

received from the wings (WW). The platinum and carbon are circuited in the ordinary way with an induction coil (I) and a battery of, say, six Leclanche cells. The secondary circuit of the coil (I) goes direct to the ordinary telephone receiver (R). A decoherer can, if necessary, be connected in the usual way, if packing should occur. Should the vibrations of the Blake transmitter be too small, an Edison electromograph can be used, as has already been suggested by another writer when dealing with the subject of telephone relays.

The diagrams do not, of course, represent a complete or working apparatus, but it is hoped that the arrangement may be favorable to practical development.

R. H. Polk, formerly manager of the Bell Telephone company at Savannah, has gone to the Georgia Telephone company, a local competitor, and is succeeded by A. T. Maxwell.

1. From London Electricity,

New England Telephone Notes.

[From the Boston correspondent of the Western Electrician.]

The American Bell Telephone company has filed the following report at the state house in Boston, dated March 28th.

Assets.		Liabilities.	
Real estate.....	\$ 1,243,745	Capital stock.....	\$2,000,000
Machinery.....	11,415	Debits.....	9,187,277
Cash and debts receivable.....	5,103,491	Reserve.....	2,935,333
Manufactures and material.....	2,497,392	Total.....	\$6,972,609
Miscellaneous.....	59,029,041		
Total.....	\$67,951,997		

From Dover, Del., comes the information that the secretary of state has received the certificate of incorporation of the New York and Boston Telegraph and Telephone company of New York. It has a capital of \$5,000,000. It is expected that it will work in opposition to the New England Telephone and Telegraph company. Officers of the New York Telephone company said that they knew nothing of the new corporation. The New England Telephone and Telegraph company operates in New England states under a license from the American Bell Telephone company. It is understood that heavy New England backing is behind the new company, which is to build and operate the long-distance line in connection with the new Massachusetts company.

The April statement of the American Bell Telephone company, showing the number of instruments placed and returned, and the net output for one month and for the period from January 1st to April 20th, does not come up to the March record, but it is stated that another record was broken in the number of instruments ordered, namely, 80,519, for the last month. These orders were about 20,000 in excess of the present capacity of the company to man-



MUNICIPAL OWNERSHIP.

ufacture and distribute. The gross output for the month was 61,481 instruments; returned, 13,079; net, 48,402. For four months the gross output has been 224,325, returned, 54,804; net, 169,521. This makes the total now outstanding 1,294,767, against 977,345 a year ago, a gain of 317,422. The Western Electric company, in view of the heavy demand for instruments, is said to be making arrangements to materially increase its capacity.

The new Massachusetts Telephone and Telegraph company has secured upward of 3,000 subscribers for its telephone service in advance of its construction of a plant. The contracts will probably be let, it is announced, some time this month for the necessary construction work.

After a lively fight in both branches of the Legislature, the so-called "telephone supervision" bill was defeated. It aroused a large amount of discussion throughout the state and mustered 85 votes on the final division. The opposition, however, came off victorious, with 105 members on its side. A proposition to put telegraph companies under the same surveillance was made at one stage of the fight, and it is likely to come forward next year with broader scope, so as to include all transmission of messages by wire in its provisions.

The Home Telegraph and Telephone company of Lawrence has been incorporated under the laws of Massachusetts, with a capital of \$100,000, by Edwin W. Burton, George G. Adams and Henry Klous.

The directors of the Mexican Telephone company, which is operated in the City of Mexico and suburbs, and is owned and managed principally by Boston capitalists, have just issued the annual report for the year ended February 28th, from which it appears that the number of telephones now in service is 2,720 against 2,486 a year ago and 2,340 two years ago. Gross earnings, in Mexican currency, were \$1,389,937; expenditures, \$824,407; net earnings, \$565,440. For construction \$38,782 was applied out of the earnings, and taxes amounting to \$6,700 were paid. The City of Mexico alone shows a gain in subscribers of 138 for the year. The company has no floating debt, and reports cash to the amount of \$15,834 in the home-office treasury.

The annual report of the New England Telephone and Telegraph company, whose annual meeting was

Western Electrician

EVERY SATURDAY.

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CORRESPONDENCE relating to electricity or any of its practical applications is cordially invited, and the co-operation of all electrical thinkers and workers earnestly desired. Clear, concise, well written articles are especially welcome; and communications, views, news items, local newspaper clippings, or any information likely to interest electricians, will be thankfully received and cheerfully acknowledged.

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CONVENTIONS AND EXPOSITIONS.

New York Electrical Exhibition, Madison Square Garden, New York, May 9th to June 3d.

American Society of Mechanical Engineers, Arlington Hotel, Washington, D. C., May 9th to 12th.

Southwestern Gas, Electric and Street-railway association, Austin, Texas, May 17th to 19th.

National Electric Light association, Murray Hill Hotel, New York, May 23d to 25th.

Exhibition of Electrical Appliances for Household Use, Brussels, Belgium, during May.

American Institute of Electrical Engineers, Boston, June 19th to 22d.

Southern Telephone association, Memphis, Tenn., July 5th.

American Association for the Advancement of Science, Columbus, O., August 21st and 25th.

National Association of Municipal Electricians, Wilmington, Del., September 15th to 17th.

Philadelphia Exposition of American Manufactures for Export, September 1st to November 30th. (Under the Auspices of the Philadelphia Commercial Museum and the Franklin Institute.)

Chicago, Exposition of Electrical Arts, Tatterhall's, September 25th to October 9th.

International Exhibition of Motor-vehicles, Berlin, Germany, during September.

American Street Railway association, Auditorium Annex, Chicago, October 17th to 20th.

The season of conventions and expositions has arrived, and those who are interested in the industrial progress and scientific and mechanical advancement of the times will have ample opportunity to learn the latest developments through these agencies. A list including the principal gatherings in which electrical and mechanical experts and students are interested is presented on this page.

Keely's motor may be relegated to oblivion, but it is not well to be too positive upon this point, as it has survived many seemingly vital attacks. However, Mr. Kinraide, who was persuaded after Mr. Keely's death to continue the experiments, has sent the apparatus and manuscripts of the dead inventor back to Philadelphia, and has withdrawn entirely from the enterprise. Mr. Kinraide enjoys a good standing in the scientific world, and the unpleasant notoriety thrust upon him by the publication of the latest exposure of Keely's methods was considered by him as a serious breach of faith on the part of the men who enlisted his services. Mr. Kinraide says his action should not be construed as a decision that Keely practiced deception, as he has not given the subject sufficient attention to pass upon the merits of the case. It is evidently intended more as a rebuke to the management of the Keely company, which first engaged him to investigate Keely's claims and then, unknown to Mr. Kinraide, published the result of an independent examination by others.

American manufactures have been received with so much favor in foreign markets that many precautions which would naturally suggest themselves to exporters have not been considered. As a result the progress of the movement to secure control of the markets of the world is likely to receive a severe setback unless American manufacturers pay more attention to the details of the requirements of foreign trade. An article prepared for the Western Electrician by the Philadelphia Commercial Museum, which has made a study of commercial subjects and is engaged in promoting the interests of American manufacturers abroad, contains a timely warning to those who have been negligent and who should be alert in the interest of the country's industries. Many of the points raised are repetitions of reports already received, but this merely emphasizes the necessity for impressing the importance of the subject on the minds of those engaged in this class of trade. It is evident that American industries will not be fairly represented and fully appreciated abroad until their promoters seriously study the conditions of trade in the countries invaded, and aim to meet the requirements as they find them.

The Vatican is now entirely lighted by electricity. Up to the time of Pope Leo's predecessor, the palace of the popes was lighted by oil lamps, but under Pius IX. gas was adopted for lighting the court yard, corridors and some of the chambers, while candles and oil lamps were exclusively used in the pope's immediate residence.

When the present pontiff succeeded he desired that the Vatican should not be behind Rome's other fine palaces in the matter of illumination, and he ordered that the electric light should not only replace the gas, but that it should also be used in his own rooms and those of the secretary of state. On February 19th the plans prepared for the installation were sanctioned by Monsignor Piffieri, the Papal sacristan and the major-domo of the palace, and since then the work has been completed.

The electric plant has been constructed in the old mills in the garden of the Vatican, not far from the so-called Eagle fountain, a name derived from the immense stone eagle which spreads its wings majestically over a waterfall supplied from the Acqua Paola. Two machines are employed, one driven by water and the other by gas, and an accumulator plant has been added as a reserve and for regulating the load.

The hydraulic machine consists of a turbine, which obtains its power from a branch of the Eagle fountain, and receives 70 liters of water, which fall from a height of 14 meters, generating a capacity of 10 horse power. The beauty of the fountain has not suffered materially from this application to prac-

tical purposes, especially as the turbine is in motion in the evening only. The gas motor is only used in case the demand exceeds the capacity of the water power and the accumulators. The 59 cells of accumulators are placed in a special room and are charged at night. The whole plant supplies 600 incandescent lamps of 10 candle power.

From the electric plant the wires run in two directions. One group supplies the Papal observatory in the Leonine tower, the Casino in the Vatican gardens, the Vatican printing office and the Specola Vaticana. The printing office will soon have electric machinery. The second group of wires runs over the walls of the Vatican and into the large court of the Belvedere. Here the wires branch off at the ground floor and into the different wings of the Vatican palace.

In introducing electric lighting the pope has not increased his expenditure, but, on the contrary, a considerable sum will be saved by its use. Previously 600 gas-burners were used in the palace, each one consuming about 60 cubic meters, at a price of about \$2.76. The cost of all the lighting amounted annually to about \$3,250. The electric lighting will be cheaper and give much better service.

English medical authorities are seriously considering the suggestion that disease may be spread through electric conduits. It seems that a correspondent to the Lancet has pointed out that in the town where he lives the main cable supplying current is laid in a four-inch pipe beneath the street sidewalk, with branch pipe for house connections, the ends of which are left open. The higher temperature inside the houses induces an indraught of air by these open pipes, and, as different houses vary in temperature and these pipes form a direct communication from house to house, it is declared that a circulation is set up between the houses, the current of air varying in velocity according to the range of temperature. In the case of houses warmed throughout by a hot-water system, the temperature may be 25 degrees higher than the external air, a condition which would cause an influx of air of sufficient velocity to blow out a candle flame. In this way, it is contended, the air of a house where infectious disease is present might easily be drawn into other houses with serious results. The conveyance of smallpox by aerial agency is established, and it is conceivable that it could be conveyed from one house to another in the manner suggested. There is also the possibility of other contagious diseases being spread in the same way. The exercising of a greater degree of care in plugging the house terminals of the conduits is suggested as an effective remedy.

The announcement of the New York Telephone company that it will reduce its rates for service has attracted a good deal of attention. The plan proposed by the company is something like that which the Chicago Telephone company embodied in the ordinance now before the City Council, only the New York measure includes all classes of patrons, whereas the Chicago company's plan is intended to apply merely to small users. The present movement is simply an effort to introduce the measured-service system in place of the flat-rate method of charging.

An examination of the rates proposed in the new schedules shows that these companies have arranged the terms so that any saving effected by the subscriber must be secured by restricted use of the system, and not at the expense of the corporations. The management hopes to induce patrons to practice economy where they are dissatisfied with the present exorbitant rates, and in this way permit it to keep up its relatively high charges for unrestricted service. It is believed that this measure may check the great increase in the average number of calls that has been shown in the reports from exchanges throughout the country of late. Heretofore it has been the policy of many operating companies to encourage the liberal use of the telephone, and business men have been induced to put desk instruments in their offices in addition to the regular wall set. The result of this policy is shown in the increase from 998,000,000 exchange connections made in 1897 by the Bell companies throughout the country to 1,231,000,000 in 1898. It will now be hard to satisfy the public with restricted service, even where a small saving may be effected.

Marconi's Experiments.

Marconi is a familiar name to-day throughout the civilized world, although the distinguished experimenter who bears it and whose work has attracted universal attention was practically unknown less than four years ago.

Guglielmo Marconi seriously attacked the problem of signaling through space when he attained his majority, and he has ever since persistently followed this line of investigation in the face of difficulties made greater by the indifference of many who should have contributed to his progress, and the opposition and detraction of others who were jealous of his success. However, he has succeeded beyond the expectations of his friends, and professional jealousies have given way before the public acknowledgment of his remarkable achievement.

The portrait which is here reproduced from the London Electrician shows Marconi to be a youthful experimenter, but the serious, thoughtful expression which it shows impresses the beholder with a sense of power and determination.

Marconi was born at Griffone, near Bologna, on April 25, 1874. His mother was an Englishwoman, and this probably accounts for the almost entire absence of foreign accent in his speech. Marconi complains only of English technical terms. He has been a student of electrical science since his 14th year, and he has been engaged upon the experiments in "wireless" telegraphy four years, as already mentioned. His first English exhibition, which was of a private nature, was given in 1896.

An up-to-date Chicago preacher found an attractive subject for his Sunday discourse in "The Parable of the Wireless Telegraph."

Announcement is made in London that J. J. Fahie has in the press a "History of Wireless Telegraphy," from its inception in 1838 up to the present day.

The Northwestern Association of the Massachusetts Institute of Technology announces a "wireless-telegraphy dinner" at Chicago, May 16th. It is proposed to transmit orders from the banquetting hall to the kitchen by the Marconi system.

Experiments are being conducted between Washington and Fort Myer, a distance of four miles, by army officers interested in wireless telegraphy. The Wehnelt interrupter is used in these tests, but no information is obtainable as to the results secured.

M. Ducretet, the French experimenter, is credited with having perfected several important improvements in apparatus used in signaling through space, although the published descriptions in the daily newspapers do not convey a very clear idea of their character and extent. He is reported to have said: "Suppose I send a message from the French shore or Eiffel Tower to Forelands. I can make it impossible for anyone else to receive it. The transmitting and receiving wires attached to masts must coincide as to curves."

A special exhibition of wireless telegraphy was given by Signor Marconi at the South Foreland, on April 20th, in the presence of the naval attaché to the Chinese legation in London, who is to report to the Chinese government on the working of the system, with a view to its adoption in the Chinese navy. London Electricity congratulates Marconi upon this indication of universal interest in his work. That journal asks when, throughout the whole history of the world, has any European invention been so quick to attract the serious notice of the "Heathen Chinese." Here, absolutely in a nutshell, is the finest testimonial that the heart of even a great man could desire.

Professor Jerome J. Green, whose exhibitions in Chicago were described in the Western Electrician April 20th, has resumed his experiments at Notre Dame. On May 6th trials were made between the university and St. Hedwidge's Church in South Bend, more than three miles away. The business district of the city, the tall buildings and the mills and factories with high smokestacks along the St. Joseph River intervened in the space through which the electrical waves had to travel, but the signals were clearer and more distinct than those received on the tug on the lake. The instruments were the same that have been used in all the experiments, with the exception of a new relay of the D'Arsonval type, that was made last week in the university laboratory. Professor Green had the vertical wire and metal sphere fixed to the church spire at the university instead of the flagpole that had been used in the former trials.

In London, it appears, the possibility of introducing the Marconi system was seriously considered by investors in cable securities. The Westminster Gazette printed an interview with Mr. J. H. Carson, the manager of the Anglo-American Telegraph company, as to the probable effect of the wireless-telegraph experiments upon the existing cable companies, in which Mr. Carson said: "I fail altogether to understand how Marconi is to counteract the great curvature of the earth met with across the Atlantic; how he thinks he can erect two perpendicular poles high enough on the shore which will permit of the current being transmitted in the way he indicates. There is a great difference between 'cross-channeling' at 30 or 40 miles and 'cross-oceania' at 4,000!

If he proposes to obtain the assistance of lightships, balloons and other aerial instruments in order to lessen the enormous distance intervening between each station, the cost would be something almost inconceivable." Another indication of the uneasiness felt is to be found in the report of the meeting of the Eastern Extension, Australasia and China Telegraph company at London. Lord Tweeddale, who presided, said, according to the London Financial News, with regard to wireless telegraphy, it was not surprising that investors, who had hitherto regarded cable securities as among the soundest in the market, should have been startled and alarmed. It was true that messages could be sent without wires between two places, not very far apart, and it was hastily inferred that the same could be accomplished equally well over long distances. In consequence, a few shares had been thrown on the market, and this had caused a serious fall, recalling what occurred when electricity became a competitor of gas. Professor Marconi's system was interesting from a scientific point of view, and in practice would be of considerable value for shipping and lighthouse purposes; but that it would successfully compete with submarine cables was in the opinion of those most competent to form one, in the highest degree improbable.

The correspondent of the Chicago Record at Glasgow, Scotland, announces that Walter Jamieson, a teacher of science, has developed an invention by means of which a vessel can be kept under full control, steered to port or starboard, stopped, driven ahead or turned back, at the will of the officer in charge of the transmitting mechanism, located at a distant station and not connected by wire or otherwise with the apparatus controlled. This mechanism, Mr. Jamieson considers, should apply more particularly to torpedoes, the uncertain path of which



GUGLIELMO MARCONI.

is the weak point in this branch of coast defense. Communication can also be established by life line through the instrumentality of this "steering power," and, Mr. Jamieson believes, stores may be conveyed to lightships and lighthouses in stormy weather. A great desideratum in wireless communication is the discrimination between one electric vibration and another; that is, a method whereby any given receiver will be influenced by the specific vibration meant for it, and by no other. Mr. Jamieson has devoted special attention to this, and has perfected a method for obtaining the desired result.

The London Electrical Review contains a concise account of the experiments made at the South Foreland, April 24th, in the presence of a French commission, with a view to demonstrating the possibilities of communicating between a moving ship and the land. The receiving and transmitting instruments on board the dispatch vessel Ibis were in a cabin, the wire to take the current being connected with the instrument room from the top of the mast, about 150 feet high. The messages were transmitted to the Ibis from the South Foreland, from Wimereux, and from the East Goodwin lightship, as also from the gunboat to each of these points, and in each instance they were recorded with unerring distinctness, the French commissioners expressing the greatest satisfaction with the system. Hitherto one of the chief objections raised to wireless telegraphy has been that it is impossible to concentrate the current; in other words, to "cut out" and prevent the message from being received at other stations where installations exist within an equal radius other than the one for which it was originally intended. Signor Marconi has now discovered an ingenious but simple arrangement by which this difficulty can be overcome, and it was on the 24th inst. tested before the French commission and at South Foreland. Messages were first sent from the Ibis to the South Foreland, and, as Professor Fleming pointed out on his recent visit, were received simultaneously by the Goodwin lightship. Signor Marconi's new invention was then tried, and the messages sent to the Foreland were concentrated there, and received at no other point, the lightship being cut out. A similar experiment was made with the lightship, the ships communicating with each other, while the Foreland was cut out. As a further test of this important invention messages were sent simultaneously from Boulogne and the lightship to

the South Foreland, where only the Boulogne message was taken by the receiver, the other being cut out at will. This experiment was also tried on board the Ibis and from the other point, and with an instance with complete success. It is stated that negotiations are proceeding with a view to placing Newhaven and Dieppe in communication by means of Marconi's system of wireless telegraphy. The expense of the installation is likely to be defrayed by the London, Brighton and South Coast Railway company on the English side, and the Northwestern Railway company on the French side.

Aluminum Feeders for the Northwestern Elevated Railroad.

On the Northwestern elevated railroad, now building on the North Side, Chicago, there will be one innovation of very great interest to the electrical fraternity. The road is built for electrical operation, and the feeders on the elevated structure conducting the current to the centers of distribution will be of aluminum instead of copper. The usual steel contact rails will transmit the current to the motors on the cars.

The Northwestern Elevated will undoubtedly be the first electric railroad in the country to use aluminum feeders, although bare aluminum wires or bars for power transmission have been used to some extent at Niagara Falls and on the Pacific Coast. But with such a powerful incentive as 20-cent copper there is little doubt that many aluminum installations will follow in places where bare conductors are permissible. The Northwestern Elevated Railroad company has entered into contract for 150,000 pounds of aluminum feeders. The contract is made on the relative weight equivalent of 47 pounds of aluminum equaling 100 pounds of copper. This is guaranteed by the aluminum manufacturer. The price of the white metal in this large contract is not given, but even at 36 cents a pound, compared with copper at 20 cents, the comparative prices for equal conductivities are: Aluminum, \$16.02; copper, \$20. Of course there are the relative costs of installation and jointing to be considered, but it seems evident that at prevailing prices aluminum is much cheaper.

Three sizes of bare aluminum cable will be used on the Northwestern Elevated—785,000, 1,000,000 and 1,300,000 circular mils in area respectively. The largest feeder is about 1 1/2 inches in diameter. Of the two larger sizes the railroad company is buying upwards of 10 miles each. The feeders will be placed in a wooden box or trough covered by the board walk between the tracks, as is the case with the large copper feeders on the Union Loop. They will be supported on vitrified-clay blocks, designed with an umbrella drip and placed nine feet apart. Every 100 feet a special malleable-iron chair is used, the cable being carried in split-spool insulators, thus holding the slack.

Experiments already made under the direction of Mr. J. R. Chapman, the electrical engineer of the Northwestern Elevated Railroad company, seem to show that the installation will be equal in every respect to copper, on a basis of equality of 157 circular mils of aluminum to 100 circular mils of copper.

Detroit Street-railway Ownership.

[Correspondence of the Western Electrician.]

Detroit, May 9.—The Detroit electric street railway deal is now officially declared off. The commissioners appointed to value the roads for the city decided that the properties were worth \$15,500,000, but Tom Johnson has insisted that he must have \$17,100,000. As there is no prospect of closing the deal, the commissioners have decided to file a final report with the Common Council and withdraw from their duties. The original stipulation of Johnson was that his price, \$15,325,000, should be cash, and as the city is not in a position to pay cash, he declared that he would take \$17,100,000 in four per cent. bonds, secured by a blanket mortgage over the assets of the street-railway properties. The mortgage was in turn to be secured by what was to be known as a "security franchise," running 30 years, with workmen's tickets at eight-for-a-quarter during certain hours, a six-for-a-quarter fare and universal transfers. Johnson refused to extend the time for the consideration of the deal 90 days to give time to sell the bonds, declaring that the Wilson interests insisted that the price named be refused or taken by May 14th. The commissioners then offered Johnson an issue of \$16,000,000 in bonds, provided that Johnson would undertake the responsibility of selling them at par. Johnson agreed, so far as he was concerned, saying that he had not a dollar's interest in the road, but adding that the Wilsons would not enter upon such a proposition. Here the matter ends.

The New York Sun relates that three trolley cars provided with the trolley attachments, such as the trolley companies use for carrying lumber, rails and the like, were recently seen going up Washington street from Sands street, in Brooklyn, loaded with furniture. The first two cars were piled high with chairs, tables, desks, rugs and carpets, while the third car was filled with stoves, stovepipe, two or three looking-glasses and a safe and two water-cases. The three carloads were the last of the effects taken from the Union Elevated Railroad company's old office, and were being removed to the Consolidated Rapid Transit company's office in Montague street.

Test of Mechanical Draft.

In the discussion of the problem of chimney versus mechanical draft, the advocates of the latter point to the possibilities in the way of reduction of fuel cost in modern boiler practice, as exemplified by the accompanying results obtained with mechanical draft by the United States Cotton company, Central Falls, R. I. This record covers a period of 52 weeks:

Number of hours run.....	2,998	
Average indicated horse power.....	1,543.84	
Coal.	Pounds Burned	Cost.
Buckwheat.....	6,074,400	\$9,316.89
Anthracite coal.....	1,173,826	800.34
Cumberland.....	565,906	836.00
Total.....	7,814,132	\$8,953.23
Cost per ton.....		\$2.29
Cost per indicated horse power per year.....		5.80

COMPOSITION OF MIXTURE.

Buckwheat.....	78
Anthracite dust.....	15
Cumberland.....	7
	100

The plant consists of three Babcock & Wilcox boilers of 335 rated horse power each, a total of 1,005 rated horse power. The engine is a cross-compound Harris-Corliss, developing, as will be noted, an average of 1,543.84 indicated horse power. The remarkably low fuel cost of \$5.80 per indicated horse power per year in a plant without economizers is primarily due to the employment of a low-grade mixture, costing only \$2.29 a ton, the burning of which has been rendered possible by the introduction of mechanical draft. The draft of the chimney, which was previously employed, lacked the intensity necessary to the free combustion of this fuel, and, as a consequence, it had been necessary to use Cumberland semi-bituminous coal.

The installation of the fan, costing less than \$600, is said to have brought about an annual saving of no less than \$6,500 in the fuel bill. The fan, which was built by the B. F. Sturtevant company of Boston, is provided with a direct-attached engine, the speed of which is regulated by a device of the chief engineer, Mr. Thomas P. Burke, whereby a scarcely noticeable change in the steam pressure immediately alters the speed of the fan, and consequently the intensity of the draft, and instantly brings the pressure back to normal. As a result the steam pressure remains almost absolutely constant.

Vesta Electric Bicycle and Carriage Lamps.

Electrical men will be interested in the Vesta electric bicycle and carriage lamp, several styles of which are illustrated in the accompanying cuts.

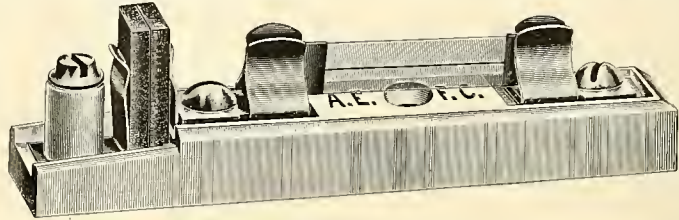
The bicycle lamp is neat and compact. It has been thoroughly tested for three years, and has given universal satisfaction. The Vesta Accumulator company of Chicago recommends it to all who wish a first-class light and one which is clean, always in order and which cannot be extinguished by wind or jarring. The lamp has no odor and is always ready for use. The manufacturers guarantee it to burn 12 hours. Every time the lamp is recharged it will burn for 12 hours and the recharging costs only five cents. The bicycle lamp is made in two sizes, the smaller using a four-volt Vesta storage battery, while a more power-

by surgeons, doctors and experimenters. It will enable a traveler to carry his own lighting system from town to town.

D. P. Perry is the president and principal stockholder of the Vesta company, and through his untiring efforts the portable storage battery and lamp have been perfected and brought into commercial use. Mr. Perry is constantly receiving testimonials in the highest possible terms from users. The company will be pleased to send further particulars of its lamps and batteries to all who are interested in the subject.

A New Supply Company.

There has recently been organized in New York a new supply company to furnish general street-railway, electric-light and contractors' supplies, under the name of the National Supply company, with offices at 54 John street. It will be under the manage-



MAXSTADT SINGLE-POLE CARBON LIGHTNING ARRESTER.

ment of E. L. Dougherty. Mr. Dougherty, it may be mentioned, is a son of Mr. John Dougherty, the well-known railroad man of the Mills building, New York.

One of the specialties that is offered the trade by the National Supply company is its Standard white cold-water paint. This paint comes in the form of a powder ready for immediate use, and has only to be mixed with cold water; but it must not be confused with whitewash and other cheap materials. This coating, it is stated, will not rub off; is not only tenacious and waterproof, but absolutely fireproof. One coat will give better service than two or three coats of whitewash. It gives a smooth, even, absolutely white finish, and effects a large saving in labor, with results incomparable with anything else of the kind. The National company does not claim it to be better than oil paint, although it keeps its fine white surface when exposed to the action of gases, etc., better than any oil paint will. It is guaranteed not to crack or peel off.

No risk is run, it is claimed, in using it for coating surfaces directly over fine goods, machinery, and racking and jarring will not cause this paint to come off. It is eminently suitable for service in engine rooms, central-station interiors and other electrical institutions. It should be remembered, too, that the Standard cold-water paint can be purchased in any color. As it is a peculiar compound and worth inspection, the National Supply company offers to send, free of charge, samples, and will send a sample card so as to facilitate a choice.

In addition to handling the above-mentioned specialties, the National company will furnish roofing and roofing materials, roof paints, preservative coatings for iron, enamels, all kinds of paints, varnish, shellac, alcohol, pipe covering, brushes, iron pipe

of electrical applications. His remarks, however, will be read with interest:

I have already trespassed too far and too long to attempt to deal with the applications of electric power. The difficulties which have been experienced in getting suitable labor have led the Americans to have a supreme faith in machinery as against hand labor, and perhaps I could not better convey the idea of the part played by electricity than by stating that it is now a recognized branch of engineering and plays a prominent part in conjunction with steam, compressed air and hydraulics. I had sufficient experience of continental practice to give me far more faith in electrical appliances than most of you here, and I was glad to know the universal experience in America has been that the electric motor has proved quite as dependable as the plant which it replaced. Two of the companies had each on order generators of 1,000 horse power, which size they regard in the same light as we regard machines of 100 horse power. We are beginning to recognize more and more the necessity of knowing American practice, and with no branch is it more necessary to be conversant than with electricity if one would wish to be up to date. Owing to more than one cause, we are perhaps as much behind continental practice as continental practice is behind American. In one particular class of machinery with which we in this country are practically

non-conversant, I found that one of the leading firms in America had already manufactured and set to work over 250,000 horse power. I was surprised to learn that I was probably the first purely electrical man who had gone over their works with a set view of seeing the applications they had made of this motive power, and their practice is so far ahead of ours that I feel it a necessity to go over frequently, and perhaps after my next visit I may, if it appears desirable, then give a contribution to this society on "Electrical Applications of Power."

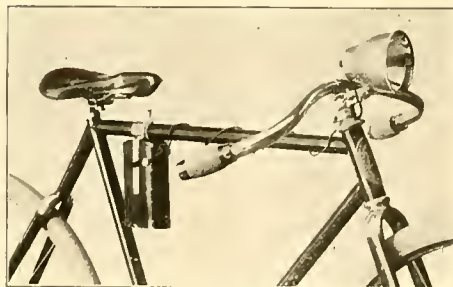
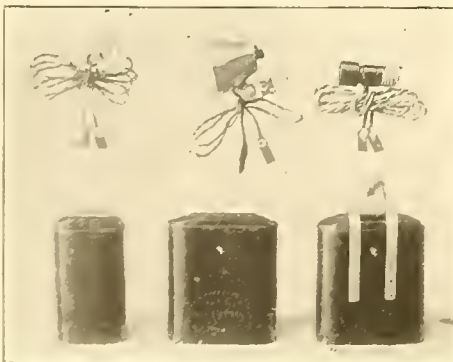
One of the most striking features in which they have developed labor saving is in the use of cranes and innumerable carrying and lifting appliances, and in this direction electricity has proved one of their most valuable servants. I remember in the stock yard of one works a man in an elevated cabin controlled about eight sets of live rollers. It was a pleasure to me to see many of the machines at work, and driven electrically, about which papers are read in this country, and on which discussions, often unfavorable, are not wanting. Among these were the Uehling casting machine, Wellman charger, blast furnace chargers, cranes and travelers, in various forms, and a very general use of motors where we employ small engines. I must say, however, that it was not the least valuable to me to know and see to what they had not applied motors, and it speaks well for the candor of our friends that they were not slow to reply to my oft-repeated question, "Now tell me of all your failures."

Maxstadt Single-pole Carbon Lightning Arrester.

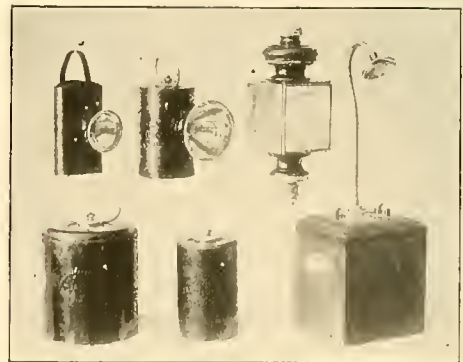
The American Electric Fuse company, 345 South Canal street, Chicago, has just perfected and placed on the market its latest improvement in a single-pole carbon lightning arrester, illustrated by the cut, which is claimed to be superior to anything on the market to-day for the protection of telephone, telegraph and fire-alarm instruments. The device has many features which will appeal to the user and should prove of special value to telephone managers. Furthermore, the manufacturer says that it costs less than any other cut-out made.

TRIFLING TECHNICALITIES.

First Coachman—"Did yez get the job?"
Second Coachman (unemployed)—"I did not. Sez



VESTA ELECTRIC BICYCLE AND CARRIAGE LAMPS.



ful light can be obtained by the use of a six-volt battery.

The electric carriage lamps, which are also manufactured by the Vesta company, have been used by the Chicago Fire, Electrical and Police Departments for the last 18 months. They have been adopted by such firms as the Chicago Edison company, Montgomery Ward & Co., Carson, Pirie, Scott & Co., Marshall Field & Co., Siegel, Cooper & Co., the Fair, Sears, Roebuck & Co., and the Columbian Field Museum. Another product of the Vesta company which has found favor is an electric lantern which can be used about the house, in mine, in gas-houses and in other places where a safe lamp is required.

The Vesta storage battery which is used in connection with these lamps is clean, compact and convenient in form. The manufacturers claim that it does not corrode at the terminals and that it is the only portable battery on the market which is entirely reliable. It can be used for supplying light or power

and fittings. Contracts will be taken for laying roofs and for belting, National wall finish, railway, mill and contractors' supplies, insulating compounds, tape, poles, cross-arms and general street-railway, electric and contractors' supplies.

American Management, Labor and Resources.

Walter Dixon of Walter Dixon & Co., electrical and general engineers of Glasgow, made a very careful study of the methods employed by American manufacturers during a recent visit to this country. Since his return Mr. Dixon has presented his impressions in a paper entitled "Some Conditions of the American Iron and Steel Industries: A Comparison," which he read before the West of Scotland Iron and Steel Institute. It is to be regretted that he touched only incidentally upon the subject

he, 'Kin yez run an autumn mobile?' 'I kin not,' sez I; 'I've druv horses twinty-six years,' sez I, 'an' whin the horses quit the business, I'll quit too,' sez I.'—Puck.

"The idea of her having the nerve to claim she first saw the light in 1878."

"I would not judge her too harshly. Perhaps she meant the arc light."—Indianapolis Journal.

M. Noir—"You have insult me, sire. I demand ze satisfaction!"

M. Blanc—"I have ze choice of ze weapon, n'est ce pas?"

M. Noir—"Oui, monsieur."

M. Blanc—"Zen I choose ze telephone of ze long distance."—Harper's Weekly.

The National Light and Power company of Jersey City, N. J., with a capital of \$15,000,000, has been incorporated.

New England Telephone Notes.

[Continued from page 269]

held last week, resulting in the re-election of the board of directors, shows gross earnings for the year 1898 of \$3,425,858; expenses, \$2,735,595; net, \$690,263; dividends, \$677,010; surplus, \$12,654. The report states that the public pay-station service has increased materially during the year, 301 being added, thus bringing the number up to 1,961. The big sleet-storm in January of last year cost the company for reconstruction, partly at the time and partly in progress since, in the neighborhood of \$200,000. The total expenditure during the year for equipment includes \$880,293.17 for new construction and properties purchased and \$1,210,022.71 for repairs and maintenance.

The underground system in the city of Boston now extends through 305,100 feet, about 58 miles of street, the total length of duct being 1,973,000 feet, or 374 miles.

During the year 191,761 feet of cable have been drawn into ducts in the city of Boston, and 59,994 feet have been removed for various causes.

The length of underground wire in use in the city of Boston at the close of the year was 28,760 miles.

In thirty-three of the exchanges outside of the city of Boston the company had, to the close of 1898, constructed 541,800 feet of conduit, containing 2,666,400 feet of duct; making the total underground system to consist of 846,900 feet of conduit and 4,639,400 feet of duct, with a wire capacity of 105,400 miles.

The balance sheet, December 31, 1898, was as follows:

DEBIT.	
Property and franchise, January 1, 1898	\$14,559,151
Construction for year 1898	889,293
Supply department	334,447
Real estate	25,219
Stocks and bonds	36,000
Accounts receivable	1,024,100
Cash	237,809
	\$17,100,023
CREDIT.	
Capital stock	\$11,976,000
Surplus	1,114,897
Bonded debt	3,282,000
Debt, accounts payable	193,369
Reserve	533,756
	\$17,100,023

The company issued \$1,049,100 additional stock during the year and retired \$150,000 five per cent. 1916-year debenture bonds and \$500,000 five per cent. 1919-year bonds. The outstanding bonded debt is \$3,549,000.

Michigan Lines.

[From the Detroit correspondent of the Western Electrician.]

The striking linemen are still at outs with the Michigan Telephone company, but the indications are that all differences will soon be adjusted. At present 51 linemen are involved. There seems to be no foundation for the rumor that the telephone girls will go on strike to show their sympathy for the linemen.

The Michigan Telephone company's gross valuation this year was fixed at \$782,000, and the Detroit Telephone company's at \$362,000. On these sums the taxes will be, respectively, \$11,730 and \$5,430.

John H. Fry, the new manager of the Detroit Telephone company, assumed his position May 1st. Mr. Fry has had experience as a street-railway manager in this city in the days of horse cars, under the Hendrie regime.

The Michigan Telephone company has offered a reward of \$500 for the conviction of the men who have been cutting its wires. The trouble is attributed to the strike now on.

The Michigan Telephone company will build two new sub-stations. The first, to cost \$13,500, will be of press brick, cut stone and terra cotta. Donaldson & Meier are the architects. The building will be erected at the corner of Cass and Milwaukee avenues. The second, of the same general design, is to cost \$7,500, and to be built on the six-mile road, near Woodward avenue. These improvements will be made at once.

The recent act of the Michigan Legislature makes it the duty of town officers to fix the value of telegraph and telephone equipment, for the purpose of local instead of state assessments. This is a radical departure from the law in operation for the last 17 years. Under the old system poles were assessed at 30 cents each and upward, sometimes as high as \$4 each. Senator McMullen of Cheboygan, in whose district the great cedar belt of the state is located, says that poles have greatly increased in price since the old law went into effect 17 year ago, and that to-day telephone poles should be assessed at about \$1.50 each. The poles are supposed to be set 32 to a mile. A line across a six-mile township, making allowances for the configuration of the land, etc., would now be assessed at about \$300 by the town board. The assessment problem in villages and cities where there is a perfect network of wires and valuable telephone and telegraph apparatus becomes extremely complicated. Another fact that adds to the embarrassment of the township officials is that the time for assessments on this year's rolls is extremely short. The new law prescribes that the assessment rolls must be completed by the third Monday in May, or May 15th. The Board of Review, to hear objections to assessments, meets on the day following.

The Detroit assessors levied taxes aggregating \$1,000,000 on local telephone and telegraph properties. This is a considerable advance over previous years. A strong light will be made before the Board of Review at the last moment. The law was

passed in such a hurry that it is not likely that many of the back-country districts will hear of the changes in time to levy assessments under the new system.

After being shut off from telephone connection for nearly a week, the residents of Gross Ile, Mich., can now use the new cable of the Michigan Bell company.

Wyandotte will have a 24-hour telephone service. The Michigan company has secured new headquarters, and General Superintendent Land promises to make the service equal to that of Detroit. Francis Murphy, manager, has resigned, and is succeeded by John McGinnis, for a long time with the Detroit exchange.

NEW COMPANIES.

Among the Illinois incorporations reported from Springfield on May 6th were two telephone concerns, as follows:

Independent Telephone company, Chicago; capital stock, \$2,500; incorporators, Blaechz Hovey, M. G. Musgrave, John R. Lyman.

Standard Telephone company, Chicago; capital stock, \$10,000; incorporators, W. T. Rowell, John Syrten, J. B. Osman.

The Seaboard Telegraph and Telephone company has been incorporated in New York, and its backers say it is the intention of the company to erect and maintain a cheap telephone service on Long Island. The capital is \$100,000, and the directors are all residents of Long Island villages. They are Dr. J. Carl Schmuck of Lawrence, Andrew McTigue, L. T. Walter, Jr., and B. C. Lockwood of Far Rockaway, John Adikes of Jamaica and Samuel R. Smith and George Christians of Freeport. The company is talking of putting in telephones for \$15 or \$20 a year. It proposes to construct a line from Far Rockaway to Montauk, on the south side, thence to Orient and Riverhead and the north side, taking in all the villages to Brooklyn.

The Booneville (Mo.) Telephone company was recently organized by local capitalists, and has been incorporated, with a capital stock of \$8,000. The list of subscribers numbers nearly 200. The promoter of the enterprise is C. J. Townsend, who built an exchange at Franklin, which proved satisfactory in every particular. At Booneville, it is announced that the ultimate scheme is a combination of all independent lines in that section of the state. Mr. Townsend expects to secure connection with Jefferson City by way of Columbia. A meeting of the stockholders was held lately and organization perfected by the election of the following-named officers: President, John S. Elliott; vice-president, Charles A. Sombart; secretary and treasurer, E. A. Windsor. These gentlemen, with J. F. Gmelich and E. W. Chilton, constitute the board of directors. The contract for the building of the line was let to the Des Moines (Ia.) Electric company. Work will be commenced at once, and the company agrees to complete the line in 90 days and turn it over to the home company. Mr. Townsend will remain as general manager.

MANUFACTURERS AND DEALERS.

The Schmidt & Bruckner Electric company of New York has moved into its new factory at 135 Elm street, corner of Howard street. The location is admirably adapted to the company's needs; the facilities for manufacture and shipping are greatly improved and the space available much larger than that at its disposal in the old quarters. Speaking of the change, Mr. Schmidt said recently: "During the last year the demands for our apparatus have increased far beyond the capacity of our old factory at 209 Greenwich street. Often we were compelled to delay orders for some weeks on account of the overcrowded condition of our machine shop. In our new building we are now in a position for handling a much larger trade than we have heretofore been able to undertake, and will also fill orders in much less time. We are pleased that we have been compelled to take this step, as it proves that our apparatus is appreciated in the telephone trade, and that there is an increasing demand throughout the country for the highest class of telephone apparatus. In other words, the telephone buyer has begun to learn that the best apparatus at consistent prices is the most economical. He knows that his income depends on the expense of maintaining the apparatus, and that when instruments are well made the cost of this maintenance must be materially less than with cheaper grades of goods."

EXTENSIONS AND IMPROVEMENTS.

At a meeting of the stockholders of the New York Telephone company, May 2d, the old board of directors were re-elected as follows: Charles F. Cutler, Thomas F. Clark, John H. Cahill, Joseph P. Davis, Thomas T. Eckert, George J. Gould, Edward J. Hall, John E. Hudson, Winfield S. Hutchinson, James Merrilue, Thomas Sherwin, Charles A. Tinker and William H. Woolverton.

L. D. Pitcher of Dixon, Ill., the principal stockholder in the Lee County Telephone company, will begin at once to build a complete telephone system in Jo Daviess County, using Sterling switchboard and Eureka telephones. The toll line will be a metallic circuit and the several exchanges will be on the common-return system. The Bell company will parallel this toll line, but the local interests have no fear of competition, as they give free toll service to all their subscribers and cheap service to all others.

Siemens & Halske Company Sold to Electric Vehicle Company.

The visit of representatives of the eastern group of capitalists known as the "Whitney crowd," who is now taking such an active part in the electrical business of the country, to Chicago last week resulted in important developments in the electrical situation here. The "Whitney crowd" already control the Metropolitan Street Railway company of New York, the New York Gas and Electric Light, Heat and Power company, the Electric Storage Battery company, the Electric Vehicle company, large street-railway properties in Brooklyn, Philadelphia and other cities and other manufacturing and operating companies. It is a formidable aggregation, actively and aggressively improving the opportunity for extending the electrical activities of the country which now offers.

One line in which the syndicate is very active is the manufacture and operation of electric vehicles. The Electric Vehicle company of New York is to be the parent company in this field. The Illinois Electric Vehicle Transportation company, with a capital stock of \$25,000,000, was incorporated in both New Jersey and Illinois last week, as a licensee of the Electric Vehicle company. It will operate electric vehicles in the state of Illinois. Samuel Insull, of the Chicago Edison company, is president of this company. He has resigned the presidency of the Fischer Equipment company of Chicago, which is about to be reorganized and its field extended as the Woods Moto-vehicle company, with increased capital, also for the manufacture of electric vehicles. It was reported that negotiations were on foot for the absorption of the Fischer or Woods company in the new Illinois company, but the deal has not gone through. Likewise, the Chicago Electric Vehicle company, formed by Mr. Insull and his associates in the Chicago Edison company early last month to operate electric vehicles in Chicago, has been dropped, the organizers having become interested in the new Illinois company.

Closely related to these changes is the purchase of the stock of the Siemens & Halske Electric company of Chicago by the Electric Vehicle company of New York, of which Isaac L. Rice is president. The sale was made on May 4th, Mr. C. E. Yerkes disposing of his interest entire, and Mr. Rice is now president of the Siemens & Halske company, Mr. C. S. Knight continuing as general manager. Besides being at the head of the two companies mentioned, Mr. Rice is also president of the Electric Storage Battery company. The manufacturing of the Electric Vehicle company is to be done in the East by the Columbia Automobile company of New York, which represents the combined interests of the Electric Vehicle company and the Pope Manufacturing company of Hartford, Conn. Whether the Siemens & Halske works near Chicago shall be operated directly by the Electric Vehicle company or by the eastern manufacturing company, the Columbia Automobile company, has not been definitely decided. And the further and very interesting question of the disposition of the general electric-light and power business and possibilities of the large Siemens & Halske manufacturing plant has been discussed only in the most general manner. It is said that one building alone of the works in Cicero has capacity for turning out 60 electric-vehicle equipments a day, which will certainly anticipate the western demand for some time to come. The factory is now busy on large work, and it does not seem likely that a large part of it will be permitted to remain idle when present orders expire, if business can be secured. The new owners of the property are very intimately connected with some of the largest consumers of electrical machinery in the country. Indeed, the business of the "Whitney syndicate" alone ought to keep a good-sized factory busy. So it is a fair assumption that, in addition to the electric-vehicle work, the Siemens & Halske works will be kept busy with electric-light and power machinery contracts. In fact, it looks as though the business of the company in all lines would be greatly increased.

The plans of the Illinois Electric Vehicle Transportation company for the car service and other business in Chicago have not been developed. Undoubtedly an effort will be made to make the use of the new vehicle cheap and popular. There will be a number of charging points for the batteries—furnished by the Electric Storage Battery company, of course—and the Chicago Edison company will supply the current.

Temporary Removal of Chicago Edison Company.

About May 15th the offices of the Chicago Edison company will be removed from the company's building at 139 Adams street in order to make way for the workmen engaged upon the job of enlarging and remodeling the building, which has been altogether outgrown by the company's business. During the summer the commercial business of the company will be conducted on the ground floor and third floor of the building at 173 and 175 Adams street, which is very familiar to electrical men of Chicago and vicinity, as it has served as western headquarters for the old Edison General company and the General Electric company, and later as the store and warehouses of the Central Electric company. During the same period the offices of the president, directors, secretary and treasurer, controller, general superintendent, mechanical engineer and attorney of the Chicago Edison company will be on the fifth floor of the Rand-McNally building, just across the street

from the temporary quarters of the other departments. About September 15th it is expected that the enlarged building will be ready for occupancy, and all the officers of the company will be reunited under one roof. The offices of the Commonwealth Electric company are temporarily removed to the locations given with those of the Chicago Edison company.

The Profit of Electric Railway Operation.

Seldom are the financial advantages of the electrical operation of railways so clearly shown as in the case of the South Side Elevated Railroad company of Chicago, which discarded steam locomotives burning hard coal for electrical distribution of power and the Sprague multiple-unit system of train operation. As has been previously shown in the Western Electrician, the change is making a fine, profitable property out of a losing one. It made the cars more attractive to passengers and increased the traffic, at the same time reducing the expenses in a marked degree. The facts are again recalled by a brief review of the first four months' business of the year, as given in the Economist, Chicago's financial journal:

"The road's traffic for April showed a gain of 16 per cent., as compared with April, 1898, and for the first four months of this year the gain in passenger receipts has been 15 per cent. over 1898. The following shows the traffic by months so far this year, compared with last:

	1899		1898	
	Whole No.	Av. Daily	Whole No.	Av. Daily
January	1,820,909	58,762	1,615,627	52,117
February	1,688,176	56,292	1,475,026	52,601
March	1,981,179	63,909	1,999,637	64,828
April	1,916,340	63,878	1,624,440	54,149
Four months	7,405,604	61,721	6,414,799	53,456

"This, however, is only a small part of the situation as compared with a year ago, for during the four months in 1898 the road, with steam operation, paid out 82 per cent. of its gross receipts in expenses, exclusive of bond interest. In November and December last, when the traffic was about the same as during these four months and the line was operated by electricity, expenses were only 57 per cent. of gross. Applying that ratio to the four months this year and allowing \$10,000 for earnings other than from passengers, as in the four months last year, the following comparative statement for the first four months of 1899 and 1898 can be made:

	Gross.	Expenses.	Net.
1899 (4 months)	\$380,330	\$216,788	\$163,542
1898 (4 months)	331,069	273,112	57,957
Gain	\$49,261	\$56,324	\$105,585

"This gain in net earnings is nearly 200 per cent. This ratio of gain, of course, will apply only in the first half of this year, for in the last half of 1898 the road was operated with electricity. The average daily traffic for the first four months last year was a little larger than the average for the whole year, but in view of the way the business keeps growing it looks as though the daily average for 1899 would be close to 60,000, and as though net earnings would be in the neighborhood of \$100,000, after paying bond interest."

Measurement of High Temperatures.

By T. H. WALLER.

In many operations in the industrial field a knowledge of the temperature to which substances must be submitted is indispensable; when we once get to the region of temperatures higher than the boiling point of mercury the difficulties of the determination of temperature rapidly increase. A little step beyond is gained by filling the tube of the thermometer with some inactive gas, such as nitrogen, so that the increase of gaseous pressure as the mercury is pushed along the tube may raise the boiling point of the metal. Again, Baly and Chorley's thermometer, which is filled with the liquid alloy of potassium and sodium, is available for some little way higher. A point, however, is pretty soon reached at which the glass of the bulb and tube softens and melts, and though some of the Jena glasses made by the celebrated firm of Schott are remarkably refractory, a very dull red heat is practically the limit of the use of thermometer of the ordinary construction, using the alloy of potassium and sodium just mentioned. Although this is quite sufficient for many purposes, such as the determination of the temperature of flues, or of a blast-furnace blast, such instruments are fragile and awkward to read; at any rate, as to flues, which, by the very nature of the case, are frequently in places which are very inconvenient to get near enough to read a fine thermometer.

The expansion of a gas may also be used for purposes of thermometry, and if the envelope is made of glass or porcelain the instrument is available up to very high degrees of temperature.

For ordinary use in furnaces, etc., the air thermometer may be considered of practical importance. It is cumbersome and needs fine and delicate apparatus to read its indication, and such are generally quite out of place in the situations where determinations of high temperatures are required.

By taking advantage of what is known of the specific heat of a metal, it is possible to reduce

temperatures in such proportion as to make them measurable by ordinary mercury thermometers. In Siemens' pyrometer a mass of either iron or copper or platinum is placed in the flue, furnace or crucible of which the temperature is required, until it has assumed the full temperature of the place. It is then rapidly transferred to a measured bulk of water and the resulting rise in temperature noticed.

In practice this method, which is fairly convenient of performance, is made uncertain by the fact that balls of either iron or copper burn at a red heat, and therefore are continually altering in weight, while balls of platinum are, especially at present "famine prices," too costly to be thought of.

Another method, based on somewhat similar principles, is that in which a current of air at known pressure issues from a jet in a form of injector and thereby draws in a regulated proportion of the furnace or flue gases to mix with the air of the jet, and so become reduced in temperature sufficiently for the use of a mercury thermometer. The graduation of such an instrument must be empirical, but when it has been performed good indications can, it is said, be obtained. Another similar instrument measures the heat of a furnace by the temperature to which a current of water of known amount per second is raised when passed through a pipe exposed to the heat.

In 1871 Siemens proposed to make use of the change of resistance to an electric current which is produced by heating for determining high temperatures.

The apparatus constructed at first by Siemens had many weak points, and the very principle on which it depended was to some extent in doubt; so far, that is, as to whether the change of resistance per degree is different at different parts of the thermometer scale—and if different, what is the exact law of the variation?

A committee of the British Association examined the whole subject and reported in 1874, not altogether favorably to the method as then proposed. Since that time, however, much work has been done on the questions connected with the platinum thermometer, and such an amount of knowledge has been accumulated, that with the modifications both in construction and in methods of measuring the alteration of resistance which have been made, the instrument has taken a very important place among thermometers.

For temperatures up to 800° or 900° C., a very handy adaptation of this platinum thermometer has been arranged by Messrs. Crompton, in which, by means of a differential galvanometer, the change of resistance produces a deflection of a needle which moves over a dial graduated directly into temperatures. This is not suited for accurate work, as the readings depend upon the voltage of the battery used, but where accumulator cells of fair size are used, so that the voltage may be taken as constant for some time, it gives a convenient means of controlling the temperature of flues or hot-air supplies.

The permanence of the platinum wire is, of course, a matter of the very greatest importance in these determinations, and a change of resistance after prolonged exposure to high temperatures was one of the causes which led the British Association committee to report somewhat unfavorably on Siemens' invention. It was found, however, that this change did not occur when the sheath surrounding the coil was composed of platinum, and it was eventually shown that it arose from the combined action of the atmosphere inside the iron sheath and the silica of the fireclay cylinder on which the coil was wound.

Platinum plays a useful part in the next method of pyrometry which we consider.

It has long been known, having been discovered by Seebeck in 1822, that if a circuit be formed consisting of two dissimilar metals a current of electricity will be set up in the circuit so long as one of the junctions of the two metals is kept at a temperature different from that of the other. If a wire is the means of connecting the metals at one junction, the effect is exactly the same, provided the two junctions with the wire are at precisely the same temperature; otherwise, of course, the inequality will set up another current, which will interfere with that which we wish to investigate.

Such a junction of bismuth and antimony has been extensively used for the detection of feeble heat radiations.

Fortunately, platinum and an alloy of platinum with 10 per cent. of rhodium, both of which metals have melting points beyond any temperatures which it is of practical importance to measure, form a thermo-couple, the indications of which are in many ways extremely valuable for technical purposes. It was brought into notice some 10 years ago by Chatelier.

The construction of such a thermo-couple is as simple as possible. A wire of each metal is taken, long enough to reach out from the place of which the temperature is to be measured to a cool place, and a joint made, either by simply twisting them together, or, better, by fusing in the oxyhydrogen flame. The method of insulating and protecting the wires will naturally vary with the degree of heat to which the couple is to be exposed. For flue temperatures a thin-walled glass tube for the protection and a smaller glass tube as insulation for one wire will be sufficient. If temperatures above the melting point of glass have to be dealt with, iron or porcelain tubes must be used, and in the case of iron

both wires must be kept away from the metal. This can be effected by taking strips of mica, say, six inches long and one-half inch wide, boring two holes at each end and threading the wires through them, so that they keep to their own edge of the strips, but pass through the adjacent holes in opposite directions. It is better to make the holes at the end of one strip coincide with those in the next, and to pass the wires through the two strips, thus, as it were, riveting them together. Mica, when it has been heated to a very high temperature, becomes disintegrated, and will then bear no handling; but encased in a porcelain or iron tube, and with the outside connections made by binding-screws fixed on a collar, there is little to disturb the wires. Roberts-Austen originally used specially shaped crucibles, with a little glove finger, so to speak, in the bottom, by which the couple could be completely surrounded by the molten metal. I am informed, however, that he now uses little clay protectors and crucibles of the ordinary make.

The galvanometer used for the detection and measurement of the current produced should be of high resistance, and be what is called dead-beat; that is, the swinging of the indicator when disturbed from any position should very rapidly cease without much oscillation round the new point of rest. For technical purposes, an instrument of what is called the D'Arsonval or moving-coil type is preferable, from the fact, if for no other, that it is not affected by masses of iron or magnets, as of dynamo, in its neighborhood. What I have used has been a galvanometer of the Ayrton-Mather patent of about 300 ohms resistance, which has worked very satisfactorily for general purposes. The calibration of such a thermo-couple is quite simply performed by taking known temperatures as fixed points, from which a curve is drawn to show the temperature for any deflection of the galvanometer.

Altogether, the thermo-couple of platinum and rhodium platinum seems to me the most practical of the various methods of determining high temperatures, though this may possibly be due to the fact that it is the method with which I have had most to do. Where very accurate determinations are required, and convenience of reading is not so essential, the resistance method is probably superior, though the difficulty of making continuous and automatic records very much reduces its technical importance.

CORRESPONDENCE.

New York Notes.

New York, May 8.—It is confidently stated that the controlling interest in the United Electric Light and Power company was sold last week. It is believed that the property passes to the New York Gas and Electric Light, Heat and Power company, but this is not known definitely, as the Third Avenue Railroad "crowd" was also after the company. Heretofore the United company has been controlled by the Westinghouse interests. As the result of the "gas war" now on, one of the companies offers gas at 50 cents a thousand, and it is possible that the electric-lighting companies may be drawn into the fight.

The advisers of the State Board of Railroad Commissioners have examined the Manhattan elevated-railway structure in this city and report it to be, in general, in good condition. C. R. Barnes was the electrical expert. He made 867 voltmeter tests to determine the difference of potential between the iron columns of the structure and adjacent hydrants, gas-lamp posts or surface rails. All tests were made while the ground was frozen. The greatest difference of potential found was 2½ volts, at the Manhattan end of the Brooklyn bridge. Mr. Barnes concludes his report with this recommendation: "After careful examination I find that there has been no serious damage caused by electrolysis to the structure of the Manhattan Railway company of New York. To prevent damage to the supporting columns of this structure in the future I make the following recommendation: That the Manhattan Railway company immediately put their structure in such condition that at no point will it be positive to other conductors in the ground more than one volt, and at this point be maintained."

It is not often that a pedestrian in a city street is struck by lightning, as the multitude of tall buildings and spires in a large city usually serves to dissipate the discharge. Yet it was the unusual that happened in last Tuesday evening's storm. Sadie Tunic, a Russian girl, 13 years old, was the victim. She was struck by lightning at Rutgers street and East Broadway, while on her way home from work. The girl was with several other companions, when she was seen to fall to the ground. She was picked up and carried into a drug store near by, and a call was sent to a hospital for an ambulance. Dr. Bergen responded, and, after making an examination, said that the girl had been struck by lightning. At the hospital it was found that she was badly burned about the abdomen, right leg, both wrists, nose and right cheek, and that she was suffering from shock. For nearly an hour after her admittance to the hospital both her legs were paralyzed, but she recovered the use of those members. The girl said that she did not have any pain at any time. The physicians do not believe she will recover, and they are greatly surprised that she was not killed outright. S.

A street lamp is shown before the No. 10 Southshire (England) Institute of Iron and Steel Works Managers.

say that she is burned severely, and that in addition to her injuries she is suffering from shock. M. S.

Northwestern Notations.

Minneapolis, May 6.—The Seattle (Wash.) Cataract company has been incorporated, with \$100,000 capital stock. The company will be the sole licensee in Seattle of the Snoqualmie Falls Power company.

The General Electric company has purchased the bonds and stock of the Dubuque (Ia.) Light and Traction company, including the Eighth and Iowa street-car lines, valued at nearly \$500,000. It is believed all the Dubuque street-car lines will be consolidated soon.

It is reported the Seattle and Renton Railway company will extend its line seven miles south from Renton to Kent, and give Seattle, Wash., connection with that town.

F. H. Fitch of Chicago has been selected as general superintendent of the consolidated street-railway system of Sioux City, Ia. This system will be known as the Sioux City Traction company, and includes five companies.

The Electric Street Railway, Light and Power company of Mankato, Minn., has increased its capital stock from \$75,000 to \$100,000.

The Benton Power and Traction company of St. Cloud, Minn., proposes to put in a new lighting plant this year, and next year to put in a public hot-water heating system.

H. F. Fiske of Cleveland, O., has become superintendent of the Electric Light and Power company's system at Muscatine, Ia.

Lighting is said to have burned out 95 of the 96 fire-alarm boxes in Duluth, Minn., in a recent storm.

The plant of the Muscatine Electric Light and Power company of Muscatine, Ia., has been sold to Harry Huttig, general manager of Huttig Bros. Manufacturing company. The plant is valued at \$300,000, and includes the street-railway, electric-light and gas systems.

The street-railway company of Burlington, Ia., has been granted an extension of its street-lighting contract for 10 years at \$85 per arc light. It agrees to extend its tracks to West Burlington.

The Fox River Valley Electric company has concluded not to build a line to Oshkosh from Appleton, since the Citizens' Traction company has started a similar line, but will now turn its attention northward. A line to Kaukauna is projected.

The Iowa City (Ia.) Electric Light company has commenced to rebuild its plant, which was burned out some time ago.

Discharged street-railway employees sought relief in the courts at Duluth. They asked the court to order their reinstatement, but the court held the receiver had acted in good faith, and declined to enter into the justice of the charge.

Luther Mendenhall, as receiver for the Duluth, Minn., street-railway company, has begun suit against the Duluth-Superior Traction company, to recover \$4,741, alleged to be due for goods sold between March 1, 1893, and May 31, 1898.

The Electric Light company of Green Bay, Wis., is preparing to furnish electric power. The company proposed to take the power from the street-railway trolley wires, but a united protest in the shape of a threatened increase of insurance rates headed that off. New wires will be strung to furnish power only, and as soon as they are in place the company will be prepared to render the additional service.

The Washington Water Power company of Spokane, Wash., has begun extensive improvements to its system. A new power house will be erected, a new flume constructed, the dam extended and new water wheels and two new dynamos of 1,000 horse power each put in. It is expected the improvements will be completed and the plant in operation by September.

John I. Willson of Chippewa Falls, Wis., has bought the electric-light plant at Owatonna, Minn., and will assume charge of the business as soon as arrangements can be made.

It is announced at Duluth, Minn., that the money is pledged for the development of the St. Louis River water power, to be transmitted to the industries of Duluth and Superior by wire.

The franchise for a local and interurban line from Stillwater, Minn., to St. Paul has been accepted by Thomas Lowry and C. G. Goodrich of Minneapolis, and work will be begun on the system as soon as possible. It is understood contracts have been let for a large amount of material to be used in the new line.

G. W. Roe, R. E. Willard and A. G. Brown have bought the Pipestone, Minn., electric-light plant. Extensive improvements will be made at once.

The Mankato Electric Railway and Power company is a projected company at Mankato, Minn., to have \$100,000 capital stock. It proposes to put in an electric street railway.

Stephen D. Carpenter has unfolded a scheme of great magnitude to the press of Des Moines, Ia., it being nothing less than an eight-track, double-deck, elevated electric-railway system from New York to San Francisco. Mr. Carpenter has a subtle invention of his own, on the perpetual-motion basis, by which every dynamo is a motor and every motor is a dynamo. All he wants is power to start his car, and he will run it through to the destination by means of his "self-generating" motors. He has the cost of his system figured out, and places it at \$300,000,000. Trains would run through from ocean to ocean in 20 hours for passenger and 40 hours for freight. Instead

of having fares based on mileage he would run it on the street-car system and charge five cents a ride for any distance. The rate per ton for freight would be one-half mill. Based on the present traffic, and moderated some to be on the safe side, Mr. Carpenter places the receipts at \$39,531,428.95. This will pay \$18,000,000 interest on the principle invested, \$6,000,000 operating expenses, and leave a net surplus of \$9,531,428.95. He proposes to tunnel through the mountains which may be in the way and in other ways overcome the obstacles which have been a preventive to rapid transit heretofore. He is endeavoring to interest Des Moines men in a company to carry out this project.

The Crowley Electric company of Duluth, Minn., advertises a dissolution of partnership.

The city of Columbus, Wis., voted bonds for the construction of a municipal electric-lighting plant.

R. A. Davidson of Chicago and E. C. Gibson of Philadelphia were in Dubuque, Ia., recently, inspecting the street-railway and electric systems, with a view to purchasing the plants. The property is worth about \$1,500,000.

The consolidation of the street-car lines in Sioux City, Ia., will result in abandoning all but one power house, which is to be enlarged and improved, and will furnish power for all the different lines.

The Seattle and Tacoma Electric Railway company has been reorganized as the Seattle and Tacoma Railway company, and new men have come in. Preparations are being made to construct the line between Seattle and Tacoma, Wash.

The street cars of Des Moines, Ia., are being equipped with fenders. The street-railway company in Des Moines announces that nearly all the employees in the operating department will have their wages advanced 10 per cent. The increase will come partly in the restoration to full running time and partly in the increase of the actual wages paid.

The Redfield (S. D.) Electric Light company will endeavor to clear its artesian well of obstructions. The well formerly furnished sufficient power to operate the plant, but became obstructed and the force impaired.

A happy thought has been dashed to earth in St. Paul. Under the charter the city can let contracts for street lighting for one year only, and the result is that the existing company is the only one which cares to bid, with the possibility of losing the contract at the end of a year. Prices have therefore been pretty well up. The idea occurred to some city official that the city could purchase the poles and wires in use and lease them to whatever company should get the contract, thus getting competition. The city has the right to place wires in the conduits of the subway companies. But the city engineer now reports that electric-light wires in the same subway with telephone wires would simply ruin the latter. So the idea cannot be used.

The Butte Electric company of Butte, Mont., suffered a loss of \$40,000 by fire in the engine and dynamo room at the Silver Bow station.

The appointment to the Board of Electricity from Minneapolis is causing some trouble. The local contractors had a meeting and agreed on one man, G. M. Jones, it is understood. Soon after W. J. Gray entered the lists and was followed by F. W. Bell. Mr. Jones thinks that, after settling upon him, the entrance of the latter two is hardly fair. R.

Canadian Intelligence.

Ottawa, May 6.—The deal by which a New York syndicate is to obtain control of the electric street railway in the city of Hamilton, Ont., and is to build the projected electric railways to Caledonia and Guelph, is said to be nearing consummation.

Nearly all the electrical energy supplied in Hamilton, Ont., is conveyed from a distance of 40 miles by the Cataract Power company. The works of this company are located at De Cew Falls and were constructed at a cost of about \$600,000. This sum included not only the erection of a power house and the necessary lines for power transmission, but also a canal connecting with the Welland Canal at Altonburg. The company has a distributing station at Hamilton, and it supplies the electric-light company in the city with power, as well as many of the leading manufacturing concerns there. The Hamilton, Grimsby and Beamsville electric railway, a line 25 miles in length, secures its power from the same source. The entrance of the company into the city is one of the greatest boons Hamilton has ever had. There is a charge of \$18 per horse power per year, whereas the cost of securing the same amount of power by coal would be about \$36.

A report from Niagara Falls states that the International Traction company took over its Canadian property last month. A meeting was held in Toronto and officers and directors for the Niagara Falls Park and River railroad were elected. The property acquired is the trolley line which runs along the Canadian side of the Niagara River, from Chippewa to Queenston, a distance of 12½ miles. The Canadians on the directorate are Messrs. T. G. Blackstock, William H. Beatty, E. B. Osler, M. P., of Toronto, and William Hendrie of Hamilton. The line will become part of a system embracing the Buffalo and Lockport and the Buffalo and Niagara roads, and the cars will be made interchangeable, so that passengers will be able to go from Queenston to Buffalo without change. The railway on the American side of the Gorge is

so seriously blocked by rock slides that it may not be operated this season. If this should prove to be the case, the entire traffic on the lower Niagara this summer will be on the Canadian side of the river.

Stealing electricity is one of the most modern offenses against the law, and the Lachine Rapids Hydraulic and Land company of Montreal has recently made a discovery which leads it to believe that it is carried on to a greater extent than it imagined. In one particular instance it was discovered that a saloonkeeper who paid for about five lights had had some 25 more put into his place, and by means of connections unknown to the company obtained that amount of free light.

The Ottawa Electric Street Railway company is installing an improved plant in its power house, which is calculated to operate all the cars at present in use in the city with one-half the water power formerly used. The dynamo, which will shortly arrive there, will be a 1,600 horse power machine. Hitherto, the company has had no reserve machinery, and in case of a breakdown everything was thrown into confusion. By the installation of the new machinery provision is made for this contingency, but the introduction of Sunday cars has rendered it necessary for the increase in the efficiency of the power plant. W.

PERSONAL.

R. J. Randolph, Jr., son of R. J. Randolph of Gates & Randolph, Chicago, has taken a position with the Bryan-Marsh company of New York.

A. J. Little and F. S. Vincent were in Chicago last week, in the interest of the Petoskey (Mich.) Telephone company, with which they are identified.

Mr. Charles E. Bibber, treasurer of the Bibber-White company of Boston, was in Chicago early in the week. Mr. Bibber is making a western trip to look after mining interests in Silverton, Colo.

Dr. F. K. C. L. Büchner, a German philosopher, is dead. He was 75 years of age and a native of Darmstadt. His best-known work is the book "Kraft und Stoff" ("Force and Matter"), first published in 1855. In this book Dr. Büchner insisted on the eternity of matter, the immortality of force, the universal simultaneousness of light and life and the infinity of forms of being in time and space.

Mr. Edwin R. Weeks, the general manager of the Edison Electric Light and Power company of Kansas City, is also president of the Humane Society of Kansas City. He is jubilant over the great outpouring of children at the recent gathering of Bands of Mercy in his city. It is said that 25,000 children and 10,000 adults were present. It was the greatest meeting ever held in the cause of humane education. Mr. Weeks presided and made an address.

A subscription is proposed for the purpose of providing a memorial window to commemorate the work of Clerk Maxwell in the parish church of Corsock, of which he was for many years an elder. In order that all who appreciate Clerk Maxwell's work may have an opportunity of contributing, it has been decided to limit the subscriptions to sums not exceeding half a guinea. The London Electrical Engineer says that Rev. George Sturrock, The Manse, Corsock, near Dalbeattie, N. B., will receive subscriptions.

Henry Sanger Snow, who has been the head of the corporation of the Polytechnic Institute of Brooklyn, has been chosen to succeed Dr. David H. Cochran as president of that institution. In making this selection the trustees have made a radical departure in the practice usually observed in selecting the head of such an institution. Instead of taking a man who has taught and gained a reputation in some other school, they have chosen Mr. Snow, who has been both a successful lawyer and a business man, but who has never been identified with educational work in any other way than that of trustee. Mr. Snow has been treasurer of the New York and New Jersey Telephone company since 1893.

A certificate of honor from the War Department has been awarded Frank Miller of Frederick Junction, Md., who has been an employe of the Baltimore and Ohio Railroad company for many years. During the Civil War Mr. Miller was a telegraph operator at Alpine, W. Va., and rendered efficient aid to the Union troops, who were forced to retire across the Potomac River into Maryland. The young operator succeeded in swimming the river also, and, remembering that the government wire ran along the old national turnpike, he had two of the soldiers lift him up to the wire, which he cut. He then applied his pocket instrument. It only required a few minutes for him to get in direct communication with the War Department through Thomas T. Eckert, now president of the Western Union Telegraph company. As soon as the War Department was acquainted with the facts reinforcements were sent from Williamsport in time to prevent the capture. For his valor and ingenuity on this occasion Mr. Miller was taken into the government service, performing the duties of scouting operator. After 35 years he is further rewarded by a certificate of honor.

ELECTRIC LIGHTING.

Benjamin Rose has closed a contract with the Western Electric company of Chicago to install a

complete electric light plant in the Rose building, Cleveland, Ohio.

Grosse Pointe village, the fashionable suburb of Detroit, will soon have its streets lighted by electricity. Work will be begun at once. Street lamps will be put wherever needed. The estimated cost is \$3,000.

The Municipal Council of the city of Vienna has passed a resolution authorizing the raising of 15,000,000 florins (\$7,500,000) for the establishment of an electric-light and power plant to supply current for both public and private use.

It is said that a new company is to be organized in Rochester, N. Y., to compete with the Rochester Gas and Electric company in supplying gas and electric light and power. John D. Lynn, an energetic and popular lawyer, formerly county judge, is at the head of the scheme, which is said to have the backing of the Western Electric company of Chicago.

"Twenty-five years ago," says the Kansas City Journal, "a Russian lad of 16 years arrived in Hays City, Kan., direct from the River Volga. He was dressed in a sheepskin coat, and his first act on stepping from the train was to light his pipe with flint and steel. Last week Hays City inaugurated a fine electric-light system, of which this Russian lad is the sole proprietor."

The Detroit Electric Light and Power company, formerly a prosperous concern, has gone into the hands of a receiver. Action was taken at the request of the Central Trust company of New York city, on a mortgage of \$350,000 on the plant. No interest has been paid since 1896. The total indebtedness is \$413,000. N. G. Williams of Detroit was made receiver. At one time this concern received over \$400,000 a year from the city of Detroit alone for lighting.

The stockholders of the Brush Electric company, the Northern Electric company and the Edison Electric and Illuminating company of Baltimore have ratified the sale of all the properties to the Alexander Brown syndicate, in which Messrs. Elkins, Widener, Holden and other capitalists are said to be interested. The price paid for the property is \$3,525,000. This will give the syndicate full control of the street-railway and electric-lighting systems in Baltimore. The United Electric and Power company of Baltimore will be organized to take over the properties. Nelson Perin will be elected president. He is also president of the United Railways and Electric company. The board of directors to be elected will consist mainly of the same men who are on the directory of the railway company. To cover the cost of purchasing the plants and to provide for improvements and other expenses an issue will be made of \$3,500,000 $\frac{1}{2}$ per cent. gold bonds, to run for 30 years, and \$700,000 of preferred stock.

ELECTRIC RAILWAYS.

A new electric street-railway line is announced from the Agricultural College to Lansing, Mich.

Active work on the double-track extension of the Chicago and Milwaukee electric railroad from Highland Park to Evanston has begun at Wilmette. It will extend north from the connection with the St. Paul railroad at Llewellyn Park.

The Lansing, St. Johns and St. Louis (Mich.) Electric company has issued a prospectus showing the probable cost of the improvement as \$720,000; estimated yield to investors, \$71,748 a year net income. It is proposed to dispose of stock to those who live along the line of the proposed road.

Archbishop Fechan of Chicago, in whose name the property at 97 to 103 Van Buren street stands, will shortly begin suit for \$150,000 damages against the Union Elevated Railroad company. It will be alleged that previous to the construction of the loop the property brought an income of 6 per cent., but that now it can hardly be rented.

The Chicago City Railway company is building a new overhead-trolley line in Sixty-third street, between Cottage Grove avenue and State street. By the construction of this line direct connection will be made by the Chicago City railway with the Blue Island and Morgan Park cars of the Chicago Traction company at South Park avenue.

What is said to be the first step in the consolidation of all the street railways of St. Louis into one system was taken recently after months of planning and negotiations, when the stock of the Lindell Railway company was increased from \$2,500,000 to \$10,000,000. The increase will be made by issuing \$5,000,000 preferred stock and the remainder in common stock.

There is trouble in Syracuse between people in the northern part of the city and the Syracuse Rapid Transit company. The company laid T-rails over its route in Butternut street without municipal sanction, as is claimed. Citizens tore up the tracks and traffic was stopped. The company threatens to appeal to the court and the citizens have the backing of Mayor McGuire and the city officers.

A syndicate of Colorado Springs capitalists, headed by W. S. Stratton, has purchased the Cripple Creek Electric railroad, and will extend it immediately

to Colorado Springs. It has 25 miles of track, reaching the principal mines. The surveyed route to Colorado Springs is 29 miles, all down grade, favorable to low freight rates. The buyers are all residents of Colorado Springs, whose capital made the great camp. The road will be rushed through to offset the steam road building by New York capitalists to Canon City.

The Milwaukee Light, Heat and Traction company has filed with the register of deeds a mortgage deed of trust to secure the payment of \$5,000,000 for additional property. The deed is made by the Milwaukee company to the City Trust company of New York. The document recites that the Milwaukee Light, Heat and Traction company has or is about to secure the property and franchises of the various suburban lines radiating from Milwaukee, and the sum named in the mortgage is needed for the purchase.

The Postoffice Department has been asked to make a ruling as to whether street-car lines authorized to carry the mails may promiscuously display on their cars the sign "U. S. Mail." It is contended that the sign properly can be placed only on cars when they are actually carrying mail, and that its indiscriminate use is designed to intimidate employees. The Amalgamated Association of Street Railway Employes has telegraphed a protest to President McKinley against this practice of street-car companies in various cities.

In the Supreme Court at Buffalo Justice Titus granted an order, upon the application of the Knickerbocker Trust company, modifying the injunction on the Niagara Gorge road to the extent that the Knickerbocker Trust company may foreclose its mortgage of \$1,000,000 against the property. This mortgage was given to secure an issue of bonds for that amount, the company owning the Gorge road having defaulted in the payment of various sums. The action will probably result in the operation of the road this summer.

The Perth Amboy Railroad company has secured a right-of-way from Perth Amboy to Metuchen, N. J., and from Perth Amboy to Woodbridge, N. J., connection at Metuchen with the Consolidated Traction company of New Jersey. It is stated that negotiations are now in progress for the acquisition of a controlling interest in the Perth Amboy trolley line by the Consolidated Traction company. The absorption of the Perth Amboy company will give to the Consolidated company a line to the Staten Island ferry. The officers of the Perth Amboy company include Leonard Lewisohn, president; C. J. Wittenberg, vice-president, and J. C. McCoy, secretary and treasurer.

The Milwaukee Electric Light and Street Railway company has purchased all the property, real and personal, of the Milwaukee, Racine and Kenosha Electric Railway company. The consideration of the transfer, as stated in the deed, is \$1 and other valuable properties, but as the document contains \$420 worth of revenue stamps the assumed consideration is \$420,000. The same deed was placed on record in Racine County, and with it was filed a deed conveying the property of the local line in Racine to the Milwaukee syndicate. The consideration for the second deal was \$300,000, thus making the price for the entire line of 40 miles of road \$720,000. With these transfers the Milwaukee company comes into possession of a continuous stretch of electric railway reaching from Waukesha, Wis., on the north, to the limits of Kenosha on the south.

It was announced last week that the United States Mortgage and Trust company of New York, with other financial interests, had secured a controlling interest in the following-named street-railroad companies in Washington, D. C.: The Metropolitan Street Railway company, Columbia Railway company, Anacostia and Potomac River Railroad company, Prightwood Railway company, Washington, Woodside and Forest Glen Railway company, Georgetown and Tennyaltown Railway company, Washington and Rockville Railway company and Washington and Great Falls Railway company. The price paid for the stock and personnel of the syndicate could not be learned at the office of the trust company. It is understood that the syndicate intends to consolidate these street-railway properties with the United States Electric Lighting company and the Potomac Electric Power company, both of which companies are controlled by the same syndicate.

An electric railway is proposed to connect Streator, Ottawa, La Salle and Peru, Ill. Naugle, Holcomb & Co. of Chicago are to build the road, and the total length of the line will be 30 $\frac{1}{2}$ miles. Some of this trackage will replace street railways in Streator. It was part of the scheme to absorb the Ottawa street-railway system, but now it is proposed to run the main line through the city, for the Ottawa electric street railway is passing through a reorganization period, and is to be improved and extended. The La Salle County Railway, Light and Power company, incorporated with a capital stock of \$500,000 and authorized to sell \$500,000 worth of bonds, is the corporation that will operate the proposed railway. The charter secured by the corporation is extremely liberal for under it the company can do a passenger, mail and express business, install arc-light and incandescent-light plants and sell electric power. The power plant of the electric-railway system will be built in Ottawa because that city is the half-way station, and also because strong hopes are entertained

that the Ottawa people will be able to install an 8,000 horse power water power plant.

Judge Bishop of Chicago has sustained the defendant's demurrer in the case of the owners of the Chicago office building against the Lake street "L" for \$300,000 alleged damages to the building by the erection of the road. He holds that where the fee of a street was in the municipality and the uses to which the street was put with the consent and authority of the municipality were consistent with the purposes for which the street was dedicated, an abutting property owner cannot recover consequential damages. An appeal to the Appellate Court will be taken.

The Municipal Traction company has been incorporated with an authorized capital stock of \$1,000,000 for the purpose of building a street-car system in Denver in opposition to the new company which has absorbed the two existing systems. Ex-Mayor T. S. McMurray is president. The company has applied to the City Council for a franchise. It asks permission to build street-railway lines on streets now occupied by the lines of other companies, the permission to take effect at the expiration of the franchises under which the other companies are now operating, about five years hence. The new organization offers many inducements in the way of low fares, continuous transfers and heated cars in the winter, and proposes to pay the city a royalty of $\frac{2}{2}$ per cent. of the gross receipts. It is claimed that the new city administration favors the company.

ELECTRIC VEHICLES.

The old "Cyclorama of Gettysburg" building on Tremont street, Boston, has been purchased and will be immediately remodeled for the use of the New England Electrical Vehicle company as an automobile-carriage depot.

The Columbia Electric Vehicle company, with a capital of \$5,000,000, has been incorporated in New Jersey. It is empowered to manufacture and operate vehicles driven by electric or other power. The incorporators are Charles A. Wendell, Andrew H. Seibel, Anthony N. Jeshera, Sherman M. Granger, Francis R. Foraker, Walter T. Dryfoos and Roland B. Harvey, all of New York, and W. B. Greely of New Rochelle.

Articles of incorporation of the Chicago Vehicle company, with an authorized capital of \$1,000,000, were filed with the secretary of state of New Jersey on May 5th. Of the stock \$400,000 is preferred with five per cent. annual dividends. The company is formed to manufacture, sell and operate all kinds of vehicles. The Chicago Vehicle company has been doing business in this city for two years, says the Daily News, under an Illinois charter, with \$25,000 stock. It is organized for the manufacture of automobile electric vehicles, and in the two years of its existence the company has done nothing, says Manager M. M. Chesrown, except experiment with patents, but the officers expect to begin business soon at Liverpool, Ind.

TELEGRAPH.

Members of Parliament and other English "imperialists" propose that the governments of India, South Africa, Australia and New Zealand shall hold a conference with the home government, with the object of reducing the present high cable rates, which, for social messages, are regarded as prohibitive.

The steamer City of Rio de Janeiro, which arrived at San Francisco recently, brought news from Honolulu that at a meeting of the cabinet the contract with the Strymser company for a cable between San Francisco and Honolulu was annulled. This action was taken on a letter from the secretary of state at Washington, declining to consider the matter.

Claims for damages to the amount of \$25,000 have been filed against the Western Union Telegraph company for the alleged non-delivery at Gardiner, Me., of a telegram of warning, which, it is claimed, would have averted a murder. The message was sent by Lizzie Small of Richmond to her sister, Mamie Small, employed in a Gardiner shoeshop, on the day that Mamie was shot and killed by Bradford Knights. The message was a warning to the effect that Lizzie had met Knights on the train bound for Gardiner. It is said that Knights had threatened Mamie on several occasions because she had persistently refused his attentions.

The Legislature of Kansas at its recent session passed a law reducing the legal rate of telegraph tolls in Kansas 40 per cent. The companies have ignored the law and announced that they will fight it. It has been the custom for state officers to run bills with the Western Union and Postal companies and settle on the first of each month. State Auditor Coler announced that he would decline to audit vouchers after May 1st unless the charges complied with the new law. The attorney-general advised this course, and now the telegraph companies must fight the state, a situation which they hoped to avoid. The business men of Topeka have begun 200 damage suits, and similar suits have been commenced in a dozen counties. Any citizen may start a damage suit against the telegraph company. He may write out one or more messages, offer them at 15 cents each, and, upon refusal by the operator, sue the company for damages. It is believed that a flood of these suits will be started. The Western Union

company will close many offices in Kansas as a retaliatory measure.

The record for long-distance practical telegraphing was broken on April 25th by the Associated Press on its regular system of wires leased from the Western Union Telegraph company. A continuous circuit of 6,001 miles, reaching from New York city to the Pacific coast, and from Chicago to New Orleans, touching Philadelphia, Pittsburg, Cincinnati, Atlanta, Memphis, St. Louis, Kansas City, Omaha, Denver, San Francisco and all the larger intermediate points South and West, was successfully worked for several hours. There were 41 operators copying from a sender in New York, with newspapers being served directly from this one circuit in 38 of the leading cities of the United States. Longer circuits had been worked for short periods, but, as far as known, this record has never been equaled, considering the number of operators copying, the number of newspapers served and the territory covered by the circuit.

The proposed all-British Pacific cable, connecting British Columbia with China and Australia, toward which the different governments have recently announced contributions, has received a setback that may result in its abandonment. A copy of an agreement entered into between the British government and the Eastern Extension, Australasia and China Telegraph company in 1893 by Lord Ripon has just been made public. In this agreement the British government agreed not to lay nor permit to be granted any concessions for laying any submarine cables connecting with Hongkong, Singapore or Labuan unless found necessary in the general interest of Great Britain. If the proposed cable from Canada is to be deprived of the large business which it was expected it would receive from a connection at Hongkong it will be seriously handicapped. Great Britain can purchase the cable of the Eastern Extension company on 12 months' notice for the sum of £300,000, and to do this seems the only way to prevent a serious delay to the Canadian cable or its abandonment altogether.

Mr. Cecil Rhodes expects to complete his telegraph line from Cape Town to the Mediterranean long before his transcontinental railroad is in operation. He is the organizer and chief stockholder of the company which will carry out this enterprise, and he says it will be completed in three years. Like the railroad, the telegraph line will connect with other north and south lines, and the company expects to string only about 2,700 miles of wire to connect Cape Town and Alexandria, which are about 5,500 miles apart. The chief stations along the line will be Bulawayo and Salisbury in Rhodesia, Tete on the Zambesi, Blantyre, capital of Nyassaland, Karonga at the north end of Lake Nyassa, three posts on Lake Tanganyika, Fort George on Lake Albert Edward, two stations on Albert Nyanza, whence the line will follow the Nile to Alexandria. It will connect with the telegraph line the Congo State is now building from the Atlantic to Tanganyika, and with others to Victoria Nyanza and the Indian Ocean. When this enterprise brings Central Africa into close touch with the rest of the world it will be a great boon to that continent.

TECHNICAL SCHOOLS.

Circulars of information relating to the courses in mechanical and electrical engineering at the University of Pennsylvania may be obtained upon application to the registrar of the college, University of Pennsylvania, Station B, Philadelphia, Pa.

At the last meeting of the Society of Arts of the Massachusetts Institute of Technology T. B. Kinraide of the Spring Park laboratory, Jamaica Plain, Mass., showed a unique form of induction coil of great power invented by him. This has been especially applied to the study of discharges by the aid of photographic processes, the plate being balanced on the point of discharge in a dark room and being developed after exposure. It reveals in a striking manner the marked difference that exists between the positive and negative discharges. The apparatus was exhibited in operation and photographic plates shown with the lantern. The figures thus produced by the electric discharge were of extraordinary beauty and size, the delicacy of detail being brought out by means of the lantern. It is thought they may be suggestive of forms useful to designers and decorators. A large and interested audience was present.

MISCELLANEOUS.

Professor Henry Carmichael, the expert appointed by the committee in charge of the liquidation of the affairs of the Electrolytic Marine Salts company to make a thorough investigation of the workings of the plant at Lubec, Me., after several months' work, has submitted a report to the committee. He says, according to a Boston correspondent of the Chicago Record, that his experiments go to show that the

Rev. Prescott F. Jernegan's process of extracting gold from sea water was fraudulent. The liquidating committee has paid \$200,000, being a 20 per cent. dividend on the stock, and the total dividend may amount to 35 per cent.

The Meteorological Institute of Denmark has sent a circular to all the institutes in Europe and America, proposing a general subscription to defray the cost of a daily telegraphic weather report from Iceland and the Faroe Islands. The Great Northern company has agreed to lay the cables immediately. Fourteen institutes have already replied favorably to the proposition.

Electricity was tried successfully on a balky horse at Evanston the other day, after the usual methods of making such an animal move had failed. Sand was dropped into the horse's ears and mouth and a fire was set under the animal. Much hair was burned off. Finally, S. Gloss, one of the chemistry instructors at Northwestern University, brought out a dry battery and connected it with the harness. The horse forgot all about balking when the current was turned on.

Speaking at a dinner given by the Institution of Mechanical Engineers in London recently Rear-admiral Lord Charles Beresford said that Great Britain was much behind the United States and Japan in the use of electricity as a motive power aboard warships. He had been amazed to see the great use of electricity aboard American warships, it being employed where the British still used steam. The American vessels were consequently far cooler than the British. Lord Charles Beresford declared that he did not feel the slightest apprehension regarding foreign submarine boats. He believed that they were far more likely to blow themselves up than to destroy the ships of an enemy.

A Washington dispatch of May 8th states that "Mr. and Mrs. Westinghouse have issued invitations to one of the largest private receptions of the season in honor of the American Society of Mechanical Engineers. The preparations are on such an elaborate scale that an addition has been erected to the Blaine mansion on Dupont Circle, which has been the home of Mr. and Mrs. Westinghouse for two seasons. The house is surrounded by a spacious lawn, and this will be illuminated for the evening with fairy-like designs of electric lighting. The house, with its great central hall and spacious rooms, will be transformed into a scene of beauty. Over a thousand invitations have been issued for this entertainment, which is to be one of the most notable in the history of the capital."

Consul Gibbs of Tamatave, in a report to the State Department, warns Americans who may be considering the advisability of promoting trade relations with Madagascar that any circulars relating to the introduction of enterprises into Madagascar should be in French to receive attention, as commercial and speculative transactions are conducted almost entirely in that language. He does not consider the conditions favorable for the introduction of a telephone system there. The government offices are connected by telephone, but the business does not demand its general adoption. Of the existing telegraph system and the prospects for extensions and improvements the report is only a little more favorable. The messages are received on rolls of tape, similar to the stock-quotations tickers in use on American stock exchanges. There are about 1,200 miles of line and wire at present, and the net is being increased. The telegraph connected with the Postoffice Department is controlled by the French government. It is not thought possible to introduce any improved telegraph system into Madagascar, owing to climatic conditions. The present system is out of order about one-third of the time, and a bulletin stating its condition is published in the tri-weekly edition of the Journal Officiel of the island.

TRADE NEWS.

It is said that no less than 4,000 persons attended the annual oyster roast of the Berlin Iron Bridge company of East Berlin, Com., at the factory last month.

W. N. Matthews of St. Louis reports that he finds ready sale for second-hand machinery, especially for the Wood arc dynamos, of which he has several that are in fine condition.

The Diagnostic Electric Lamp company of New York has been incorporated with a capital of \$2,500. The directors are John W. Morrison, New York; Jacob Felsenstein, Baltimore, and Edgar Poe Reese, New York.

The Electric Arc Light company of New York—the pioneer in enclosed arc lighting—has removed to 11 Broadway (Bowling Green building), and with increased manufacturing facilities can promptly ship direct and alternating-current enclosed arc lamps,

Mr. W. C. Hubbard is the general manager of the company.

From Boston comes the announcement that L. A. Chase & Co., the Shawmut Fuse Wire company, the John P. Cushing company and the Linton Manufacturing company have been combined, under the name of the Chase-Shawmut company, which has been formed for the purpose, and will manufacture and deal in electrical specialties. The address of the Chase-Shawmut company is 161-163 Fort Hill Square, Boston.

N. W. Mixer, for many years connected with the Western Electric company, has been appointed western sales agent for Kerite insulated wires and cables, known the world over as one of the best wires on the market. Mr. Mixer's headquarters will be in room 1526 Monadnock building, Chicago. W. R. Brixey, the manufacturer of Kerite wires, is to be congratulated on securing the services of a man so well known to the trade as Mr. Mixer. It is confidently expected that Kerite wires will now become even better known in the West than at any previous time in the history of their manufacture.

Many electric-light and electric-railway managers will doubtless be interested in the announcement of the Hays Construction company, Troy, O., which makes a specialty of remodeling plants and putting them on a paying basis. W. S. Hays, the manager of the Hays company, is an engineer of wide experience and is particularly qualified for work of this kind. The Hays company is taking a leading part in construction and engineering work, and has remodeled a number of plants which for various reasons were not paying dividends and has put them on a paying basis. The company bears an excellent reputation and will be pleased to hear from those who may have trouble with their plants.

The Montauk Multiphase Cable company of New York has arranged for an exhibit of its automatic thermostatic fire-detective cables at the Paris Exposition next year. The company will make a complete display of its fire-detective wires in connection with all interior electrical adaptations, and this will undoubtedly attract much attention. The convention of Municipal Electricians, to be held in September of this year at Wilmington, Del., promises to eclipse any previous convention of this organization in numbers and exhibits. The progress of municipal fire protection, from its beginning down to the present, will be illustrated by apparatus in vogue during the various stages of invention. The Montauk Multiphase Cable company will have a complete display of its product in connection with all interior wiring.

BUSINESS.

The Western Electric company of Chicago has the western agency for the Tuerk alternating-current ceiling fans. These fans are made for 60, 125 and 140 cycles, and for 52 and 104 volts. A complete stock is carried in Chicago.

The Ball Engine company of Erie, Pa., reports recent sales of engines for electrical service to the Elgin Watch company, Elgin, Ill.; Western Union Paper company, Chicago; Edelweiss restaurant, Chicago; George public school, Philadelphia.

The encouraging report that night work is necessary comes from the Triumph Electric company of Cincinnati, which is having exceptionally good business. So far this year, the Triumph business has been almost double that of the corresponding period of last year.

The Emerson Electric Manufacturing company of St. Louis makes direct-current fan motors, as well as alternating-current motors. A descriptive bulletin, with price-list of '99 direct-current fan motors is sent on application. All fans have the improved Parker blade, said to throw more air with less noise than the usual type.

No other concern in its line is said to exceed the volume of business of the Swarts Metal Refining company of Chicago, which makes a specialty of buying scrap-copper wire, for which it pays the highest market price. Electric-light men and other users of copper wire will find it a considerable item to dispose of their scrap copper. The Swarts company is well known in electrical circles, having been in the business for many years.

The H. T. Paiste company's new attachment plug is becoming popular with the trade. It possesses many features of merit. Among these are mentioned the fact that both the base and the cap are made of porcelain, and that it is so constructed that there is no danger of accidental breaking. The Electric Appliance company is general western agent for this plug. It carries a large stock in Chicago and tells of a growing demand for these attachment plugs that cannot but be gratifying to the manufacturers.

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued May 2, 1899.

623,968. Pneumatic Transmission System. Birney C. Batcheller, Philadelphia, Pa. Application filed February 7, 1898.

A normally closed gate is situated in the main tube in

advance of the junction, and means are provided for opening and closing the gate in the main tube by utilizing an electromagnet. A normally open circuit includes the electromagnet; means for closing the circuit are actuated

by the approach of a carrier to the gate; an electromagnet is arranged to actuate the means for operating the switch, a normally open circuit including the electromagnet and means for closing the circuit arranged to be operated by a selecting device on the carrier

623,989. Electric Motor. Homer W. Corse, Melrose, Mass. Application filed September 9, 1898.

A series of contact points turn with the armature and are electrically connected with respective sections of the armature coils, and other contacts are electrically connected with the commutator and turn with the armature but longitudinally movable with respect thereto, whereby different sections of the armature coils can be cut in or cut out of circuit as desired, and the speed of the dynamo correspondingly varied.

624,041. Process of Manufacturing Soluble Barium Compounds. Charles B. Jacobs, East Orange, N. J. Application filed October 12, 1898.

The process of making an acid from a sulphate consists in heating a mixture of sulphate and sufficient carbon to extract part only of the oxygen of the sulphate, thereby producing in the first instance a mixture of the sulphid and sulphate, and then continuing the heating in an electric furnace until sulphur dioxide ceases to escape.

624,075. Telephone Switchboard. James M. Over-shiner, Elwood, Ind. Application filed December 17, 1897.

The combination with an annunciator drop and a jack, of an arm intermediate of the drop and jack and adapted to co-operate with the drop and a plug to enter the jack and co-operate with the arm, to restore the drop.

624,095. Telephone Register. Herbert T. Richards, New York, N. Y. Application filed January 19, 1899.

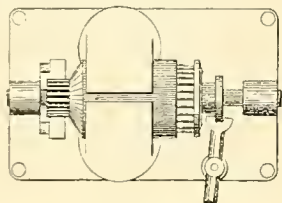
This invention comprises a movable device co-operating with the receiver support adapted to obstruct the return of the receiver after removal therefrom and means for connecting or disconnecting the device with a register, whereby the subscriber after making a call may operate the register and make a record of the conversation

624,124. Electric Line Conductor. Dwight G. Stoughton, Hartford, Conn. Application filed June 17, 1897.

In an electric conduit there is the combination with a line conductor and an insulated base for the same of supports, angle irons within the conduit having their lower arms secured to the inner face of the supports, their upper arms inclining inwardly and upwardly, but not meeting over the conductor, and flexible non-conducting leaves secured only to the upper faces of the supports and resting on the upper arms of the angle irons, completely covering both, extending inward and meeting at a point over the conductor, and their outer edges attached without superimposed elements to the upper faces of the supports.

624,128. Permanently Adjusted Telephone. Ernest H. Thielscher, Brookline, Mass. Application filed September 1, 1898.

In a telephone the combination of a cup for containing the magnet spool, a detachable pole-piece for the magnet, applied to the cup, and means for preventing relative rotary motion of the cup and pole-piece.



NO. 623,989.

624,141. Electric Meter. Roger S. White, New York, N. Y. Application filed September 2, 1898.

This is a motor meter and there is the combination with an armature comprising a flat, non-metallic disk, armature coils carried by the disk, and a flat, annular retarding ring made of aluminum, of a field magnet, with respect to which the armature rotates, the field magnet also influencing the retarding ring.

624,142. Means for Reducing Friction in Rotating Shafts of Electric Meters. Roger S. White, New York, N. Y. Application filed October 5, 1898.

The shaft of magnetic metal rotates in a horizontal plane; there is a bearing for each end of the shaft, a horseshoe magnet, the poles of which carry the bearings and attract the ends of the rotating shaft to relieve the bearings of its weight, and means for adjusting the bearings longitudinally on the magnet so as to increase or decrease the magnetic attraction.

624,154. Electrical Warp Stop-motion for Looms. William H. Baker, Central Falls, R. I., and Frederic E. Kip, Montclair, N. J. Application filed September 7, 1898.

A circuit-closing gravity drop for an electric warp stop-motion is made of thin, flat metal, having an elongated form, a thread aperture, a longitudinally extending guide slot below the aperture to receive the terminals of the circuit, and a narrow lateral thread passage connecting the slot and thread aperture.

624,155. Warp Stop-motion for Looms. William H. Baker, Central Falls, R. I., and Frederic E. Kip, Montclair, N. J. Application filed October 10, 1898.

A circuit-closing device for an electrical warp stop-motion is described consisting of a terminal to extend across the warp and provided with means for straining and fixing in position, and a warp support, connected with the terminal and substantially parallel therewith, the support being vertically adjustable with respect to the terminal.

624,156. Gas-lighter. William F. Kessler, New York, N. Y. Application filed September 9, 1898.

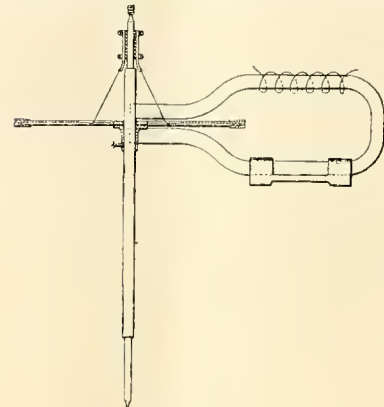
Means are provided for closing the circuit between the terminals of an electric gas-lighter, and throwing the circuit back to a state of a vertically movable wick support, and a spring to hold the lighter at or near the closed position. The wick support is in a sparking chamber is pivoted in the plate and adapted to rise and fall from the spark means for pressing the wick into the gas. The contact with the adjacent end of the wick support, which carries the terminals, is adapted for electrically connecting the lever to the other electrode immediately before the spark is thrown and is provided.

624,230. Secondary-battery Plate and Method of Producing Same. Augustus J. Marquand, Cardiff, England. Application filed December 27, 1897.

The improved method of producing plates for secondary or storage batteries consists of the protection of certain parts of lead plates or foundations against the action of sulphur, the treatment of such partly protected lead plates or foundations in a closed box with sulphur at or near the melting point of lead, and the subsequent reduction or peroxidation by electrolytic means of the prepared surfaces.

624,250. Controller for Electrically Propelled Vehicles. Emil B. W. Reichel, Berlin, Germany. Application filed February 2, 1899.

The electric motors are mounted upon and propel different cars of a train; a conductor extends between and is adapted to unite the motors, and controllers are also provided upon the different cars and associated each to each with the motors comprising resistances, stationary and movable contact parts for effecting the connection of the several motors in series and parallel arrangement, and additional switching mechanism for controlling the control of the motors by means of a given controller, or for connecting the corresponding motor for regulation through an additional controller.



NO 624,141.

624,272. Automatic Circuit-closer. George A. Wall, Providence, R. I. Application filed March 11, 1898.

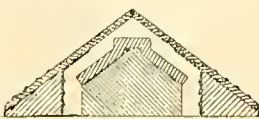
In a device of this character the combination with a thermostat shell and electrodes of a frame secured at its opposite ends to the face of the shell, and having its intermediate portion raised to permit the circulation of air around the frame, a spring in operative relation to the electrodes, and a fuse constituting a connection between the spring and frame.

624,277. Electro-pneumatic Controlling System. George Westinghouse, Pittsburgh, Pa. Application filed August 20, 1898.

In a car propelled by one or more electric motors and provided with air-brake mechanism it is proposed to have the combination with a motor controller of mechanism for operating the controller connected to a source of fluid pressure, electromagnetic means for controlling the application of fluid pressure to the operating mechanism, and means for automatically returning the controlling switch to the "off" position, depending directly upon the application of the air brake

624,299. Electromagnetic Actuating Device. Byron E. Chollar, St. Louis, Mo. Application filed October 28, 1898.

An electromagnet comprising a base, uprights, cross-piece having binding screws, magnetic coils having core extensions, side supports, armature shaft journaled in the supports and having one of its ends connected with one of the supports by worm screw and worm thread, the armature mounted on the shaft, the check adapted to limit the movement of the armature in both directions, and means for keeping the armature against the check, when the armature is in normal position.



NO 624,124.

624,300. Testing Apparatus for Electric Signal Circuits. Abner Coleman, Taunton, Mass. Application filed May 16, 1898.

Claim is made for the combination with a electric signaling circuit of a normally open branch circuit containing an amperemeter and a normally open shunt circuit containing a voltmeter, and a switch constructed and arranged to include the branch circuit in series with the signaling circuit, and for simultaneously closing the shunt circuit

624,304. Electric Railway. Harry B. Cox, New York, N. Y. Application filed October 31, 1898.

A safety electric railway system comprises a closed insulated conduit, a live movable line wire loosely arranged in the conduit, and raised supports of conducting material on which the line wire loosely rests at intervals, and electric feeder connections to the supports at intervals.

624,306. Electric Water-boiler. Joseph C. Cramer, Los Angeles, Cal. Application filed November 8, 1898.

A water-heater is used comprising a fire box open at the bottom, so that it may be placed over a heater, a series of heating tubes closed at the top and opening into the fire box, a shell inclosing the tubes and forming a water compartment, the shell having a dome-shaped top provided with small perforations to permit water to spray onto the tubes, and a water reservoir surrounding both the shell and fire box.

624,382. Electric Piano. George Schrade and Har-

old W. Shonnard, New York, N. Y. Application filed August 17, 1895.

In a self-playing piano the combination with an electric motor for operating the same of a pulley on the motor shaft, a drum shaft carrying a pulley, a belt passing over the pulleys, a switch lever for controlling the current to the electric motor, a belt shifter for the belt, and a connection between the belt shifter and switch lever.

624,386. Electrical Rosette. Albert P. Seymour, Syracuse, N. Y. Application filed February 10, 1899.

A one-piece porcelain rosette having a solid back has separate channels for the lamp wires and openings respectively at diametrically opposite points in the side walls, and extending therefrom inwardly and downwardly to a single opening in the center of the lower face, and the metallic terminals secured in position on both sides of the rosette for the attachment of the line wires and the lamp wires.

624,390. Electric Signaling System. Eugene S. Simms, Denver, Colo. Application filed October 28, 1898.

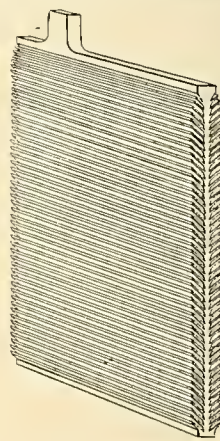
One feature is a normally open electrical circuit having conductors extending into the shaft, a signal bell or device located in the circuit, and circuit-closing mechanism mounted on the cage and comprising a shaft mounted to turn on its longitudinal axis, and also capable of movement on an axis extending at right angles to its longitudinal axis, contact arms mounted on the shaft and adapted to engage the conductors of the circuit as the shaft is actuated, and a suitable electrical connection between the contact arms.

624,396. Controller for Electrical Train-signaling Apparatus. William A. Stambaugh, Effingham, Ill. Application filed March 1, 1899.

The combination is described of two pairs of electro-magnets, levers arranged to be moved by the attraction of the magnets and having weighted outer ends, a post, a spring contact arm supported by the post, an adjustment screw located beneath the spring arm, a bracket post, a rocking lever mounted in the bracket post, a contact arm carried by the rocking lever adapted to receive the spring arm, a finger carried by the rocking lever and an insulator carried by the finger.

624,409. Controller for Electrical Elevators. Burton C. Van Emon, San Francisco, Cal. Application filed August 30, 1898.

In a controller for the purpose described a series of fixed contact arms independently movable, a series of series contacts co-operating therewith, means for moving the contact arms so as to make successive contacts, springs for returning the arms and a fluid resistance connected to each arm.



NO. 30,687.

624,413. Watchman's Clock. Albert E. Waggoner, Muskegon, Mich. Application filed November 25, 1898.

A watchman's clock has a revoluble dial with electro-magnets, vibrating armatures connected therewith and carrying contact arms arranged to make an impression upon the dial, a spring-actuated knife in position to puncture the dial if the door of the clock is opened, and an arm on the door to carry the knife from contact with the dial, an arm movably attached to the dial post, a corresponding arm pivoted to the clock frame in position to be engaged by the first-named arm, a contact plate in position to engage the pivoted arm, and an alarm to be sounded thereby.

DESIGNS.

30,686. Electric Arc-light Casing. Charles E. Hartman, Lynn, Mass. Application filed February 7, 1898. Term of patent 14 years.

30,687. Storage-battery Electrode. Theodore A. Willard, Cleveland, Ohio. Application filed March 22, 1899. Term of patent 14 years.

30,688. Converter Box. Ferdinand Schwedtman, St. Louis, Mo. Application filed August 28, 1897. Term of patent seven years.

30,689. Converter Box. Ferdinand Schwedtman, St. Louis, Mo. Application filed October 9, 1897. Term of patent seven years.

30,690. Converter Box. Ferdinand Schwedtman, St. Louis, Mo. Application filed October 23, 1897. Term of patent seven years.

30,694. Manhole-cover Frame. Thomas P. Greger, Philadelphia, Pa. Application filed April 6, 1899. Term of patent 14 years.

30,695. Manhole Cover. Thomas P. Greger, Philadelphia, Pa. Application filed April 6, 1899. Term of patent 14 years.

30,696. Manhole Cover. Thomas P. Greger, Philadelphia, Pa. Application filed April 6, 1899. Term of patent 14 years.

30,697. Manhole Cover. Thomas P. Greger, Philadelphia, Pa. Application filed April 6, 1899. Term of patent 14 years.

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EVERY SATURDAY.

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No. 20

Underwriters' New Laboratories.

At No. 67 East Twenty-first street, Chicago, are now located the testing laboratories of the National Board of Fire Underwriters and the offices of the Electrical Bureau established by that body. The increase in the work which the underwriters are called upon to do in testing electrical devices and materials, as the specifications in the National Electrical Code are elaborated from year to year, made some change necessary this spring. The old quarters were at 157 La Salle street, and Mr. W. H. Merrill, Jr., the electrician in charge, finally decided on removing from the central business portion of the city and establishing his offices and laboratories in a building leased for the purpose in a locality where sensitive instruments could be employed in the work and the necessary amount of room secured.

The building selected (Fig. 2, page 280) is on

acetylene-gas generators were under test. This laboratory is equipped with a workbench and apparatus used in the testing work, to which additions will soon be made.

Space on the upper floor is about equally divided between the offices, which are on the street front, and the electrical laboratory in the rear. At the head of the stairs, on the left, is Mr. Merrill's office, a glimpse of which, with its occupant, is shown in Fig. 4. East of this room is the general office, illustrated by Fig. 3. The picture on this page (Fig. 1) shows the electrical laboratory. Direct current is taken from the Edison company's three-wire street mains, and operates motors that drive direct-current and alternating-current dynamos, arranged so that practically any voltage desired, either of continuous or alternating current, may be had for the testing of the various electrical devices submitted

of manufacturers and others engaged in electrical enterprises.

Mr. W. H. Merrill, Jr., the chief of the bureau has directed the work since its inception, when it was first established as an outgrowth of the electrical department of the Chicago Underwriters' association. Although a young man, just entering his thirties, Mr. Merrill is well known in the electrical field through his connection with insurance interests, beginning with the Boston board soon after he left the Massachusetts Institute of Technology, in which he was a member of the class of '89, and afterward in Chicago, where he was engaged by the Chicago Underwriters' association, as well as the Western Insurance Union, covering 22 central western states, and later, through the National Board of Fire Underwriters and the Underwriters' National Electric association, forming



FIG. 1. UNDERWRITERS' NEW LABORATORIES.—ROOM FOR ELECTRICAL TESTING

Twenty-first street, near the corner of Indiana avenue, and but two blocks from Lake Michigan. It is of brick and has two stories of unusual height and a capacious basement. The structure is well suited for the uses to which it is being adapted, having light on all sides, with an adjacent yard space for the storage of calcium carbide and combustible oils and the building of high-temperature ovens, the bureau work having been recently extended to embrace acetylene-gas and gasoline-lighting experimentation, as well as electricity. It is quickly reached by the South Side elevated road, the Indiana avenue trolley line, the Illinois Central suburban service and the Cottage Grove avenue cable road at Twenty-second street.

On entering the vestibule from the street, directed by a modest brass sign, "Underwriters' Laboratories," the visitor finds that the offices are on the upper floor, to which access is given by a flight of steps at the right. Directly opposite the street entrance are doors leading to a large apartment, comprising nearly all the space on the ground floor. This room, illustrated by Fig. 5 (page 281), and the greater part of the basement are devoted to hydraulic and gas-engineering experimental work. At the time the photograph was made a number of

for examination. There are also a marble switch-board, a good collection of measuring instruments of both the portable and standard laboratory types, tanks for immersing insulated wire and all other apparatus found necessary or convenient in making the tests for which the laboratory was established.

In addition to the offices and laboratories, the building contains a photographic dark-room, with an outfit of chemicals, and storage rooms, where the articles that have been tested are carefully put away, each with its tag giving date and brief data of test, with a reference to the corresponding entry in the files of the bureau.

Though the new quarters are not as yet entirely fitted up, the removal having been made the latter part of April, it will be seen that the outfit thus far installed shows commendable enterprise on the part of the underwriters in their endeavor to treat the questions they are called upon to decide, which are of interest to the electrical fraternity, in a scientific and competent manner. The work of this bureau since its beginning in this city, five years ago, is well known to electricians throughout the country, and its extension at this time will undoubtedly meet with a favorable reception on the part

of the present bureau. Associated with him and in charge of special departments are Mr. Franklin H. Wentworth, formerly with the General Electric company, Mr. Theodore Varney, a graduate of the Massachusetts Institute of Technology, formerly with the Commercial Electric company, and Mr. Benjamin H. Glover, formerly instructor in electrical engineering at the Armour Institute of Technology. Referring to Fig. 3, Mr. Wentworth is seated at the desk on the right; Mr. Glover is at the desk in the center, engaged with a caller, and Mr. Varney is on the left.

The success of the underwriters' work in this direction has been largely due to the spirit of fair-mindedness which they have shown in submitting questions concerning which differences of opinion have arisen to councils of recognized authority in different fields of electrical engineering practice, and in using their power and influence to carry out the decisions arrived at in a fair and impartial manner. The national conference on standard wiring rules is a fair example of the existence of this spirit, all the associations of a national character in the country being represented at the meetings of this body, and the rulings of its committees having been generally adopted by all the interests affected. The

consultation between the manufacturers of rubber-covered wires and the underwriters' committees at the bureau offices last December is a creditable example of the methods employed in the testing work, which have demonstrated to reputable and honest manufacturers the fact that a properly organized and conducted bureau of this kind is a great benefit to the business.

Plan of Consolidating North and West Side Street Railways.

It is said that an Illinois corporation, to be known as the Chicago Traction company, with a capital stock of \$35,000,000—\$15,000,000 preferred (five per



FIG. 2. UNDERWRITERS' NEW LABORATORIES — EXTERIOR VIEW OF BUILDING.

cent.) and \$20,000,000 common—will be formed for the purpose of leasing and operating the lines of the North Chicago Street Railroad company, the West Chicago Street Railroad company and the Chicago Consolidated Traction company. These companies own what are usually known as the "Yerkes lines," Mr. C. T. Yerkes being a large owner and the principal figure in the management of all of them. They comprise practically all the surface street-railway property on the North and West sides of Chicago, including eight cable lines and a larger number of electric roads. The plan is said to be to issue preferred stock at once at par to the amount of \$12,000,000. Of the amount thus realized \$10,000,000 will be paid to Mr. Yerkes for his holdings, and the remaining \$2,000,000 will be held in the treasury. Subscribers to the preferred stock receive a bonus of common stock equal to 50 per cent. of their subscriptions. Mr. Yerkes is to retire, and the new company will lease the existing companies at rentals given in the shape of guaranteed



FIG. 4. UNDERWRITERS' NEW LABORATORIES.—MR. MERRILL'S OFFICE.

dividends—six per cent. on West Chicago stock and 12 per cent. on North Chicago. The rate on Consolidated Traction stock is not stated. The profits of the newcomers will be found in the surplus net earnings of the roads over the dividends guaranteed. Of the \$12,000,000 of preferred stock to be issued at once, \$2,000,000 has been subscribed in Chicago and the remainder in New York and Philadelphia. The stockholder of the existing companies will vote on June 2d on the proposition of leasing the roads to a new company. It is said that the Chicago Traction company will issue no bonds.

Of course the question of franchise rights is a fundamental one with the proposed new company. The financial aspect is that one of the foundations of the deal is an opinion rendered by eminent lawyers to the effect that the traction companies' claim to a 99-year right to use of the "streets" under their original charters are valid.

National Electric Light Association.

Preparations are actively under way for next week's convention of the National Electric Light association at Madison Square Garden, New York. The association will be called to order by President Young before noon on Tuesday, and will finish its business, according to programme, on Thursday afternoon. The programme of subjects for instruction includes the reading of the following-named papers: "Single-phase Distribution," Herbert A. Wagner, St. Louis; "Underground Electrical Construction," Louis A. Ferguson, Chicago; "Some Notes on Underground Distribution of Two-phase Current in New York City," E. A. Leslie, New York city; "The Development of High-tension Service" (illustrated by stereopticon), Calvin W. Rice; "A Local Transmission System—Development and Operation," W. S. Barstow, Brooklyn; "Alternating-current Generation and Distribution—Changes Contemplated in Atlanta," H. M. Atkinson, Atlanta; "Means of Affording Safety in Electrical Distribution," W. L. R. Emmet, Schenectady; "Rotary Transformers and Storage Batteries, and Their Relation to Long-distance Transmission," Professor W. L. Robb, Hartford, Conn. The discussion on transformers will be led by Professor Goldsborough of Purdue University, Lafayette, Ind.

The headquarters of the association will be at the Murray Hill Hotel. The members and visitors will naturally pay much attention to the exhibits in the electrical exhibition now in progress in Madison Square Garden. The entertainment features arranged promise to be very enjoyable. One is an "automobile ride" for the ladies on Wednesday afternoon. The party will start from Madison Square Garden at about three o'clock, and the route will include Fifth avenue, Riverside Drive, Grant's

vicinity. At this writing it is possible to give the names of only a few of the gentlemen who will make up the party on the special train. It is expected, however, that among them will be the following-named: George S. Searing, J. Scribner, F. N. Boyer, George S. Whyte, W. J. Low, James Wolf, W. F. Collins, C. E. Kammeyer, M. E. Baird, W. R. C. Smith, F. E. Colbert, W. T. Van Dorn, Will Smith, Edward Grier, L. K. Cushing, Chicago; P. H. Korst, Racine, Wis.; E. E. Wade, Colorado Springs, Colo.; R. E. Lucas, Jonesboro, Ind.

Canadian Electrical Association.

At a meeting of the committee appointed to make the local arrangements for the approaching annual convention of the Canadian Electrical association, to be held at Hamilton, Ont., a plan of entertainment was considered and adopted. The dates selected for the convention are the 28th, 29th and 30th of June. A sufficient number of papers, on a variety of subjects of interest to those engaged in the various departments of electrical work, have been promised. Among the features of the entertainment will be a trip over the Hamilton radial railway and an evening excursion on the lake, a trip to Grimsby Park over the Hamilton, Grimsby and Beamsville electric railway and a visit of inspection to the stations of the St. Catharines Power company at St. Catharines and Hamilton.

Fort Wayne Electric Works.

The General Electric company's latest acquisition, the Fort Wayne Electric Works, with principal business office in Schenectady, N. Y., was incorporated at Albany on May 10th with a capital of \$500,000 to



FIG. 3. UNDERWRITERS' NEW LABORATORIES.—GENERAL OFFICE.

tomb, etc. The ladies and their escorts have been invited to visit Columbia University and take tea in the West Hall, as well as to inspect the library, with its unique scheme of lighting, the engineering buildings and the mechanical plant. On the return the New York Electric Transportation company has invited the party to visit its "stables" and see how the automobiles are furnished with their motive power, how the batteries are charged and other interesting operations.

On Thursday a special steamboat excursion will take the ladies up the Hudson as far as Yonkers, to give a view of the Palisades, back through the Narrows, past Tompkinsville, where Sampson's fleet is anchored, up through Buttermilk Channel, past the Brooklyn navy yard, returning in ample time for dinner.

President Young has appointed the following-named committees:

Reception committee.—Thomas E. Murray, chairman; Chas. A. Schieren, H. L. Shippy, C. H. Jackson, L. F. Regua, Geo. T. Manson, J. W. Lieb, Jr., Paul Spencer, E. A. Leslie, E. H. Stevens, William Brock, E. H. Maher, Jr., A. J. Purinton, A. H. Patterson, W. S. Barstow.

Entertainment committee.—Charles W. Price, chairman; W. L. Candee, Theodore Beran, Win. F. Zimmerman, J. W. Godfrey, C. O. Baker, Jr., Prof. G. F. Sever, A. H. Patterson, Fred Vieweg, E. P. Peck, T. C. Martin.

A large western delegation to the convention is assured. A number of westerners who will attend the meeting are now in the East; others will go without regard for the opening day or the "Chicago special," as their business engagements permit, while a large party will take the special train over the Wabash route, arranged to leave the Dearborn station in Chicago at noon on Sunday, May 21st, arriving in New York at 3 p. m. on Monday. Transportation arrangements for this train are in charge of Mr. W. Forman Collins, 510 Marquette building, Chicago, who is the master of transportation for the association for Chicago and

manufacture electrical and other apparatus. The directors are Henry Paul, C. S. Bash and J. W. White of Fort Wayne, Ind.; S. D. Greene, J. P. Felton, E. E. Gilbert and George C. Hollister of Schenectady.

The Fort Wayne papers say that the reorganized Fort Wayne Electric Works are secured for that city for a period of at least to years by the efforts of James J. Wood, the manager of the new company. The new building will be completed at once, and Mr. Wood says that it will not be long until other new buildings will be erected, which will double the size of the present plant. He expects that this enlargement will be accomplished within a year or two, and says that, in that length of time, 1,000 men will be employed in the works.

Chicago Electrical Dinner.

The annual dinner of the Chicago electrical fraternity at the Grand Pacific Hotel on May 11th was an enjoyable affair. The following-named gentlemen were in attendance:

B. J. Arnold,	E. W. Hammer,
F. B. Badt,	Samuel Insull,
Charles A. Brown,	H. L. Ide,
Charles E. Brown,	E. W. Jewell,
Ernest Bookwalter,	A. L. Kuehnstedt,
Willard T. Block,	E. B. Kittle,
W. Forman Collins,	E. A. Meysenburg,
E. H. Cheney,	Charles Munson,
E. L. Clark,	Laverne W. Noyes,
H. H. Cutler,	Lewis J. Osborn,
Edward B. Ellicott,	F. S. Richmond,
E. C. Ferguson,	B. E. Sunny,
F. S. Garton,	H. M. Sloan,
Edward R. Grier,	George S. Searing,
W. K. Howe,	James H. Wolf,
Arthur Hartwell,	George S. Whyte,

B. E. Sunny acted as toastmaster, and speeches were made by several gentlemen, while others related interesting anecdotes. Excellent music was furnished and the decorations were especially attractive.

Standards for Direct-connected Generating Sets.

By J. B. STANWOOD.

An important factor in America's industrial progress has been the extended application of standards. There are standard dimensions for materials, standard sizes, parts and capacities of machines, standard gauges for close measurements, standard systems of inspection and testing, etc.

These different forms or methods of standardization have usually originated or developed in commercial and manufacturing activities, independent of any governmental instigation or control. They are universally recognized and employed wherever industry and commerce exist throughout our land.

This principle, as carried out in our individual shops and factories, has developed the well-known interchangeable system of construction, which, by forcing attention and care upon little things, has further specialized operations, and has stimulated the development of special machines to perform these operations, to the end that the cost of production has been greatly reduced.

Such standardization inside and outside of the shops also aids rapidity of production, inasmuch as standard material can be kept in stock to form standard parts or to complete standard machines, apparatus or goods, all before these are even ordered.

These results—cheap production and prompt delivery—in connection with a high grade of product (to which these methods contribute) are most powerful factors for securing and maintaining foreign trade. Such influences are particularly active in America to-day.

In the steam-engine industry these methods have been largely in use; but within the past few years they have been rendered partially inapplicable by a radical change in the environment, due to the introduction of electricity and the employment of high steam pressure.

By the introduction of an electrical generator attached to and directly driven by the main shaft of a steam engine a new machine has been evolved. But the introduction of this system has brought a world of complication and expense to both the engine and generator manufacturers, while to some serious financial loss has been the result.

The principal cause of these difficulties has been the lack of standard sizes, speeds and important dimensions of electrical generators, so that the adaptation of the steam engine in each case has been made a special problem, frequently requiring special design and construction.

To complicate the matter, the determination of the sizes and speeds of such generators is usually in the hands of a third party who is not in touch with either the engine or generator builder. He may be a co-sulting electrical or mechanical engineer, an architect, a salesman, an agent or some person presumably skilled in deciding upon the necessary machinery to satisfy certain conditions.

If, fortunately, there had existed a list of capacities and speeds for electrical generators that was recommended by proper authorities, this list would gradually be used by such persons in securing and specifying the machine to be employed. As it now is, any odd size and speed may be selected by them; as, for instance, to my knowledge, a 45-kilowatt generator to be operated at 210 revolutions was once specified, almost at random.

STANDARDIZATION

What are the features that need standardization? First, for the use of the outside engineer there is a need for a standard series of capacities and speeds; and, second, those parts of the engine and generator which have to be connected or fastened together should be standardized for each different size to facilitate the assembling of the combined machine or "set."

1. (a) Relative to a standard series of capacities and speeds, the different capacities or sizes should be selected to satisfy the usual demands of the market. The number of different sizes should not be too large, in order that the cost of production may not be enhanced by too great a variety of both generators and engines.

In this connection there might be a standard method of determining the capacity of a generator, which would designate, with a given load or percentage of overload, a given time limit within which a permissible increase of temperature of the field coils, armature and commutator can occur.

(b) Relative to speeds, there should be at least three classes of speeds for each size or capacity of generator, corresponding, in the main, to the three classes of engines now on the market. These are known respectively as slow, medium and high-speed engines. By arranging the generator speed in this manner most of the conditions arising in practice could be met. There would be slow speed for factory, manufacturing or street-railway service, which would be expensive, but durable and easily tended. A medium speed could be used for lighting plants or conditions where lower first cost and a more limited space exist, but which will require closer attention and will probably be less durable. Lastly, the high-speed "set" would be required for limited space, low first cost, but it will require close attention and will probably be subject to heavier repairs.

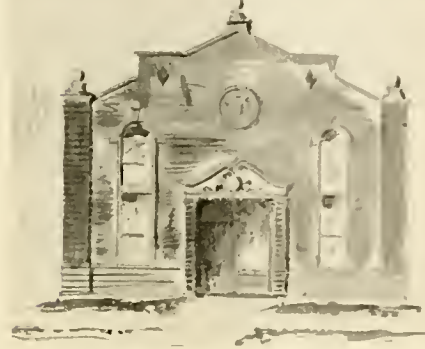
Perhaps a series of generators could be arranged

so that by a modification in windings only a given size for a standard slow speed could be used for larger standard sizes at standard medium and high speeds.

2. As to the standardization of the dimensions of those parts of the engine and dynamo which are connected together there are: (a) The shaft diameter and armature bore, which should both be expressed in thousandths of an inch; (b) the length of shaft outside of the engine and the location thereon of the outboard bearing should be given in inches and feet; (c) the distance from center of armature to sub-base, in inches, and, (d) the length and width of generator

lar generator and make expensive change of metal plates in a direct-connected set. It is pointed out that in particular there should be some degree of uniformity in engine and armature shaft which are to be coupled and run together. Present practice makes the former much the larger. In this connection the fact must not be lost sight of that the engine is a reciprocating machine, while the generator is a rotary. Professor Aldrich said that while it was difficult to standardize each unit separately, it was more difficult to standardize the dual unit. The trouble has been laid at the door of the generator because of his seeming indifference to the wants of the steam man. He came into the field long after the steam engine had occupied it, and some thought he should sacrifice his own requirements for that reason. It should be remembered that the electrical designer of a generator is governed by capacity—that is, the number of lights, etc.—and the engine man must handle the results but cannot alter the pattern. That is, the engine man must follow the other and give him what he wants.

Mr. Forbes stated that if anything were to be done toward adopting standard sizes, patterns, speeds and capacities it should be done quickly, for he knew that in two foreign countries they were considering the same questions mainly with the view of retaining trade. They appreciated the evil effects of the present hazardous way of manufacturing two machines intended to run together, and proposed to remedy the trouble if possible. The meeting voted to appoint a committee to confer with the American Institute of Electrical Engineers and formulate standards covering the steam engine and dynamo.



NEW CHICAGO MUNICIPAL ARC LIGHTING PLANT

base, and the size and location thereon of the bolts which attach it to the sub-base, are probably all that are required.

Such a system would materially reduce the complication of construction and erection. A fewer number of engines with their sub-bases and generators would be required. These, in the marketable sizes, could be carried in stock ready for any combination, thereby permitting manufacturers to avail themselves of multiple production, so great a factor in reducing costs, improving quality and facilitating delivery.

An American system of standards well introduced abroad and at home might give to us a large share of the electrical and engine business of the world.

In this connection it seems to me that our society and the American Institute of Electrical Engineers are the proper authorities to undertake such an investigation as will, by their recommendation, bring about such a result.

To initiate a movement for this purpose I move that the council be requested to communicate with the American Institute of Electrical Engineers to ascertain if that institute will agree to appoint a committee to co-operate with a similar committee to be appointed by the American Society of Mechanical Engineers, to determine upon and recommend a standard series of capacities, speeds and necessary

New Chicago Municipal Arc-lighting Plant.

Work will soon be begun on the new arc-lighting station for street lighting to be built by the city of Chicago on Wentworth avenue near Sixty-third street. The working drawings for the building and machinery installation are now being prepared in the office of City Electrician Ellicott. The building will be 41 feet wide and 178 feet deep. It will be one story high. The walls will be 20 feet high in the clear and support a steel truss roof. Ordinary brick will be used for the side and rear walls, with the pressed-brick street front shown by the accompanying illustration.

A transverse wall will divide the space in the building into two rooms, one for the engine and dynamo, 100 feet deep, and the other, for boilers and coal storage, 75 feet deep. The initial generating plant will consist of a vertical, compound, condensing engine of 700 horse power, driving, by shaft and belting, four 150-light arc dynamos.

A large territory in the southern part of the city will be lighted from this station. The lamp contract has not been awarded, but the Western Electric company has secured the order for the 50 miles of line wire needed. This wire will be weatherproof, of No. 6 B. & S. gauge and will be supplied at 10 1/2 cents a pound. The other bidders were the American Electrical Works of Providence, the Chicago



FIG. 5. UNDERWRITERS' NEW LABORATORIES—GAS AND HYDRAULIC ENGINEERING DEPARTMENT

dimensions for electrical generators for direct connection to steam engines.

And, furthermore, if a favorable response be received, then the president be requested, with the concurrence of the council, to appoint a committee of the proper size to co-operate with the committee to be appointed by the American Institute of Electrical Engineers for the purpose herewith set forth.

Discussion

This paper caused considerable discussion. A complete system of standardization is of more moment to the engineer than to the dynamo builder. The engine designer must fit his machine to each particu-

Insulated Wire company and the Simplex Electric company of Boston, the tenders ranging from the price given to 20 1/2 cents a pound, or from \$13 to \$112 a mile.

General Electric's Election.

The annual meeting of the shareholders of the General Electric company was held in Selwyn, N. Y., May 10th, 130,000 shares out of a total of 208,000 being represented. The business transacted, except the election of a board of directors. The board is the same as last year, except that J. P. Ord of Schenectady succeeds F. S. Duggins of New York.

1. Abstract of paper read before the American Society of Mechanical Engineers at Washington, May 10, 1899.

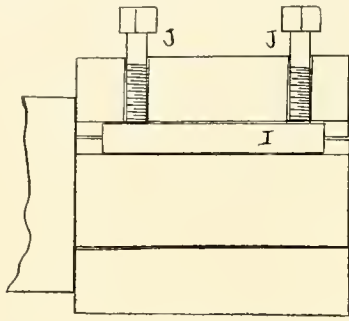
Care and Repair of Electric Fans.

By B. F. FELLO.

At a certain hotel one of the electric fans rattled so badly that the noise disturbed the guests. The hub of the fan wheel was fastened to the shaft by means of set-screws (J J) Fig. 1. These rested upon the key (I). This key was too large for the key-seat and every turn of the wheel produced a knocking sound as the edges of the key contacted with the sides of the seat. Screwing down upon the set-screws was only a temporary relief. I removed the key, cut tin pieces to match the sides and bottom and top of the key-seat, replaced the key, which now fitted tight, and reset the screws, after which the rattling ceased.

PERFECTION IN MANUFACTURING

Greater care in manufacturing fans and the adjustment of the parts when the fan is set up will assist in producing better results. Give us ring rails that are short, perfectly straight and level, and stiff enough to obviate all vibration. In fact, build your fan so substantially that, when the fan is set up and running, there will be the least possible amount of



FIGS 1 AND 2. CARE AND REPAIR OF ELECTRIC FANS.

vibration. A fan that vibrates very much will cause the rings to wear rapidly as well as the other parts of the frame.

The very high speed at which many fans are running make it necessary that the machinery should be more perfectly built, and, when set up, correctly adjusted. A higher speed of fans is obtainable and practical. Four thousand revolutions is not above what fans ought to run on medium work. To do this successfully, improvement can and must be made in building the ring frame. All frames should have adjustable feet for ends and sampsons. This would simplify the leveling and cause it to be done more frequently. No one doubts the importance of keeping the machinery level. In Fig. 2 is shown a very careless way of attaching a fan to a wall. The flange (A) is set-screwed to the wall with lag screws, which soon loosen and let down the flange as at (B). This, of course, changes the level of the spindle on which the fan revolves, and causes much trouble. The best remedy is to use bolts (C C), Fig. 3, which pass completely through flange and top piece; loosening is prevented by use of the nuts.

Some of the causes for a fan not running well are as follows: Worn or ill fitting bushings, that is, those not adapted to the style or shape of the ring; loose or worn rings or those of uneven friction surfaces; worn guide wires or guide wires out of alignment with the spindle. The guide wires should be set so as to have the bearing come directly over the top of the spindle and kept straight. In starting new fans they usually run heavy and give uneven tension and cause breakages in consequence of the rings being unpolished. Burnished rings can now be supplied, thus doing away with this disagreeable and annoying feature. Sometimes the rings are not set square on the ring rail, or it may be that the ring rail is not level. Accumulations of dirt or waste and lack of oil on the bearings will cause them to stick and sometimes throw them out of position, making bad work. These faults may be removed by regular oiling and cleaning and may be to a great extent prevented by having the bearings protected with a sleeve. Warped and out-of-true bearings will cause unnecessary trouble and bad work, and all those which are found in this condition ought to be at once refected.

EMERY WHEELS FOR GRINDING.

There is much grinding to be done in connection with the repair of electric-fan machinery. A good way to fix up an emery-wheel for this purpose is shown in Fig. 4. (A) is the wheel, (B) a slide to which is fixed the adjusting wheel (C). The part to be ground is held securely in place at (C) by the clamp (D). For accurate grinding the points to be aimed at are: (1) A free cutting wheel of the proper grade and size; (2) correct speed, so that the inequalities on the surface of the work may be removed with the smallest amount of pressure; (3) the maintenance of a uniform temperature, that the finished surface may be true. In very accurate grinding temperature has a very considerable influence upon the result. Uniformity of temperature is most essential. To maintain this uniformity water should be used especially if the work is revolved upon centers. It is advisable to use water over and over again, as by doing so there is less difference between the temperature of the water and that of the work than there would be with fresh water. A little carbonate of soda

added to the water prevents excessive rusting of the work or the machinery. For grinding internally upon cylindrical surfaces a free cutting wheel must be used and the work revolved slowly. The wheels should be softer than those applied to the external surface, as a much larger portion of the wheel periphery is in contact with the work.

REPAIRING A SPLIT HUB

If the hub of an electric fan gets cracked as at (A), Fig. 5, it may be repaired by turning off a groove near the shoulder and into this groove a ring (B) may be pressed, as in Fig. 6, thus drawing the parts together.

Some Suggestions on X-ray Work in the Brain.

By N B DELAMATER, M. D.

The discovery of the X-ray marked a distinct period, not only in the scientific, but also in the medical and surgical world. The daily press took it up at once and made much of it. While there is not so much said in the secular press of late, yet it

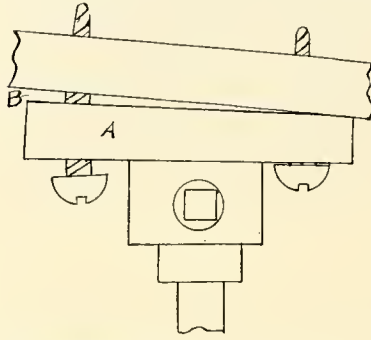
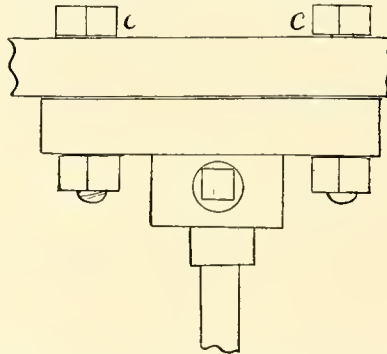


FIG. 3. CARE AND REPAIR OF ELECTRIC FANS.

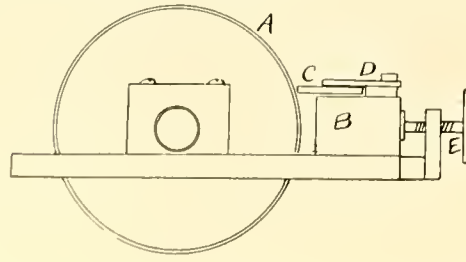
is still an interesting topic for rather frequent articles. There was and still is a wide discrepancy between what the daily press can accomplish and that which the scientist can do with this wonderful discovery. The art of skiagraphy is really in its infancy, however, and it is possible that science may yet do even more with it than the press claims for it.

The laity expects great things of Röntgen's discovery. You have all been asked to use it, or



whether the X-ray would not reveal the trouble of your patient. It is quite the thing now in any obscure case for the lay brother to think that if you would only use the X-ray everything would be as plain as day. The present limitations of its use are not at all understood. In no field of work is this more true than in the brain. It is my object in this short paper to call attention to some of these limitations of the X-ray without neglecting the useful applications to which it is adapted.

First, I want to call attention to the fact that for brain work the ordinary apparatus is of no use. One



FIGS. 4, 5 AND 6 CARE AND REPAIR OF ELECTRIC FANS.

needs an actual picture to study, and that carefully. You will often be obliged to give careful attention to both the negative and the print of the skiagraph in order to learn what it has to say to you. It requires an expert in the use of the X-ray to make a useful negative and print. The position of the head, the kind of tube to be used, the length of exposure, the development and printing all require experience and skill as well as knowledge.

To-day there is very little danger of any kind of

accident from the use of the Röntgen radiation. In the early cases, with the long exposures, many very unpleasant things occurred. In the hands of novices and amateurs many unpleasant things occur now, but in the hands of an experienced, competent man rarely.

What will the skiagraph tell us? The location and extent of fractures in the skull. In this alone it is of inestimable advantage. A large number of epileptics, of insane or demented, have found relief through operations following the use of the X-ray. We know that in falling the patient was not always particular to strike on a spot that would produce localizing symptoms, nor is the highwayman more considerate; as a result there are many cases in which we are quite sure that traumatism is at the root of the trouble, but are unable to locate the spot from which the convulsion arises or from which the disturbance of mental equilibrium springs. In these cases the X-ray may enable us to operate by locating for us.

There are many cases of epilepsy in which a sufficient cause for the convulsive attacks cannot be found. In these cases we are not doing our duty by our patient unless we have a skiagraph taken and carefully examined. In a fair proportion of them we will find evidences of removable trouble and by operation produce a cure. It is true that you will find many cases in which nothing will be shown, but it pays even then to know that there is nothing that can be shown by any means at our command.

Then, again, in long standing cases of insanity, we should use this diagnostic help. To be sure, in a large majority of the cases we will not find anything, but in a few we will find abnormal conditions, clearly indicating either that nothing can be done or that an operation is hopeful; and if we are able to cure even one per cent. of the cases examined it will certainly pay for all the others.

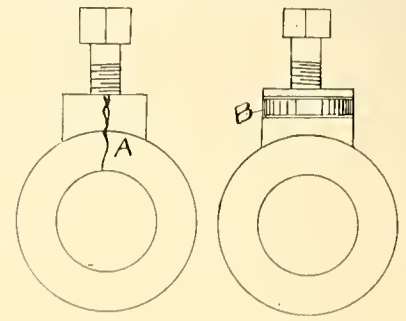
Bullets or metallic substances in the brain can be located positively. It requires, however, a side and front or back view to make location accurate. Tumors have been diagnosed and located. Sclerotic degeneration, if well advanced, can be determined. Abscesses have been placed and circumscribed thickening of the skull can be located. The latter, by the way, is a very common occurrence following circumscribed cerebral meningitis.

There are various forms of degeneration of brain tissue which alter the density materially that can be determined and located. In this class of cases we determine simply that there is something that will warrant an exploration. Blood clots are very rarely discovered. They do not differ sufficiently in density from the surrounding tissues to be at all clearly defined. There is probably no greater or more frequent disappointment than the statement we are so frequently obliged to make, after having diagnosed a hemorrhage, that we cannot locate by the use of the X-ray.

The next point I want to make is that the various things discoverable are not clearly outlined; they are not well defined. Remember the X-rays show difference in density, nothing more, and you will readily see that exceeding care must be taken in every stage of the process or we shall be misled. All you can see is that one portion is darker than another, and in the outlining of this darkened or possibly lighter area all possible sources of error in the work must be considered carefully.

In very many instances the help will be simply in possibly confirming the evidences of other symptoms in the case. In many instances we will find a sufficient warrant to make an exploratory opening in the skull, while in a few we find position indicated for operation. The day will surely come, however, when we will be able to do very much more with this wonder.

In answer to a number of questions which were put to him after the reading of the paper, Dr. Delamater said that one requirement for successful work was the employment of the proper vacuum tube for



the particular case in hand. One kind of tube was best for making skiagraphs of the hand and another for the brain. Then, too, skulls and brain matter vary in density, and different tubes may be indicated for different patients. Again, the electromotive force and frequency of the current used should be carefully considered for each case. All these requisites for the production of useful skiagraphs showed the need of skill and experience in the X-ray operator.

Touching on the possibility of damage suits growing out of the use of the X-ray in surgical cases, the

Read before the Illinois Homeopathic Association at Chicago, May 11, 1899.

doctor said that while the final decision of this point rested with the courts, it was his opinion that operators could not be held responsible for more than the best knowledge of the art in existence at the time the exposure was made.

Electrical Exhibition.

Following is a revised list of exhibitors and a floor plan of Madison Square Garden, New York, showing the location of the features of interest at the Electrical Exhibition:

- American Engine company, Bound Brook, N. J.
American Electric Novelty and Manufacturing company, New York.
American Vitriol Conduit company, New York.
American Electric Vehicle company, Chicago.
American Miniature and Decorative Lamp company, New York.
American Circular Loom company, Chelsea, Mass.
Adams-Bagnall Electric company, Cleveland, O.
American Mutoscope company, New York.
American Pulley company, Philadelphia.
Allgemeine Electricitaets Gesellschaft, Berlin, Germany.
American Electrician company, New York.
Appert Glass company, New York.
American Electrical Specialty company, New York.

- Frank, I. P., New York.
Fisher Foundry and Machine company, Pittsburg, Pa.
Feddler, John H. (relies from Cuban War), Poughkeepsie, N. Y.
Granger, Francis, New York.
Griffing, A. A., Iron company, Jersey City, N. J.
Gold Car Heating company, New York.
General Incandescent Arc Light company, New York.
Heirath, F., New York.
Hill Electric company, W. S., New Bedford, Mass.
Hardmuth & Co., F., Ratibor, Germany.
"Hub," The, New York.
Harris Safety company, New York.
International Correspondence Schools, New York.
Indiana Bicycle company, Indianapolis, Ind.
India Rubber and Gutta-percha Insulating company, New York.
Incandescent Electric Light Manipulator company, Boston, Mass.
Jones Manufacturing company, H. W., New York.
Johns-Pratt company, Hartford, Conn.
Jones & Son, J., New York.
Kaufman & Alexandre, New York.
Katzenstein & Co., L., New York.
Kieley & Mueller, New York.
Lamble, H. V., Rockaway Beach, L. I.
Libbey Glass company, Toledo, O.
Law company, The, New York.
Machado & Roller, New York.
McGay Engraving company, Baltimore, Md.
Manufacturers' and Inventors' Electric company, New York.

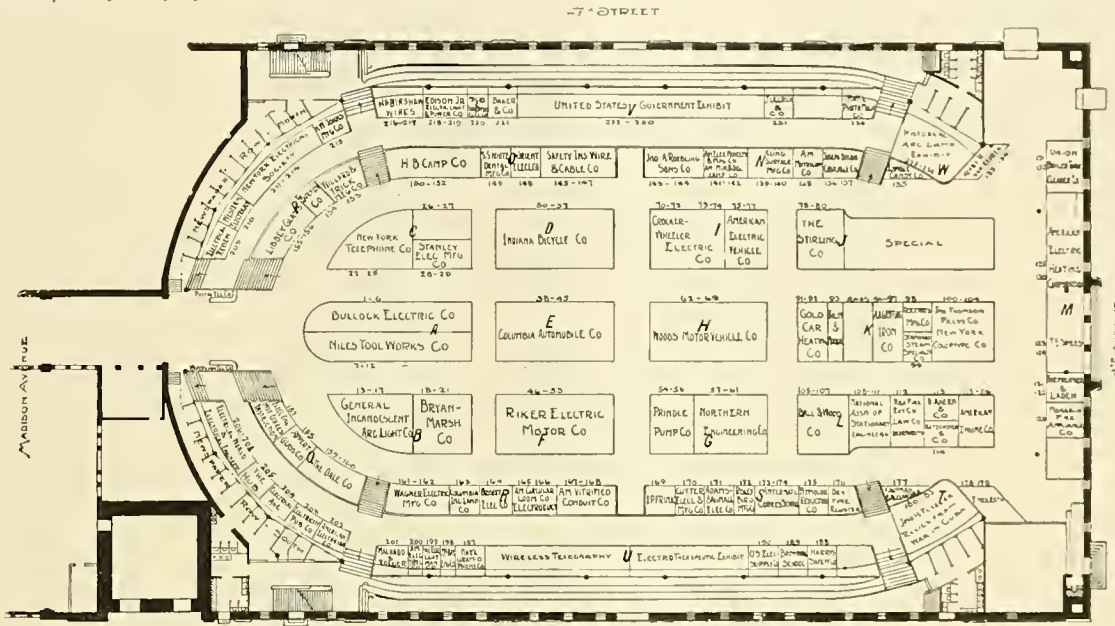
- Van Keuren, Henry R., Brooklyn.
Wagner Electric Manufacturing company, St. Louis.
Williams, J. P., New York.
White, S. S., Dental Manufacturing company, Philadelphia.
Wagner Electrical Manufacturing company, St. Louis.
Willard & Frick Manufacturing company, Rochester, N. Y.
Whitney Electrical Instrument company, Penacook, N. H.
Wright Discount Meter company, Brooklyn.
Western Electrician, Chicago.
Western Union Telegraph company, New York.
Woods Moto-vehicle company, Chicago.

Patent Office Business in April.

(From the Washington correspondent of the Western Electrician.)

The Patent Office has long been recognized as a reliable indicator of the business conditions of the country, and for this reason the following statement of the business of the Patent Office for the month of April, as compared with the same month of last year, compiled from the official records may be accepted as a fair illustration of the improvement in the business outlook.

The number of applications received for patents and for the registration of trademarks, labels and prints for April, 1899, was 3,684, as against 3,542



PLAN OF AMPHITHEATRE AND ARENA CIRCLED ELECTRICAL EXHIBITION.

- American Electrical Heating corporation, Cambridgeport, Mass.
Ahearn, D., New York.
Ball & Wood company, New York.
Buffalo Forge company, Buffalo, N. Y.
Boston Electro-duct company, Boston, Mass.
Bullock Electric company, New York.
Bossert Electrical Construction company, Utica, N. Y.
Bryan-Marsh company, New York.
Baker & Co., New York.
Burnet company, The, New York.
Browning School, New York.
Cling-surface Manufacturing company, Buffalo, N. Y.
Cincinnati Shaper company, Cincinnati, O.
Crocker-Wheeler Electric company, New York.
Camp company, H. B., Aultman, Ohio.
Colliery Engineering company, Scranton, Pa.
Corey, R. B., New York.
Columbia Incandescent Lamp company, St. Louis.
Chicago Rheostat company, Chicago, Ill.
Dietz, Schumacker & Boyd, Cincinnati, O.
Dixon, Jos., Crucible company, Jersey City, N. J.
Dale company, The, New York.
Dickford Drill company, Cincinnati, O.
D. & W. Fuse company Providence, R. I.
Dey Time Register company, New York.
Electrical Age Publishing company, New York.
Estey & Saxe, New York.
Electrical Institute of Correspondence Instruction, New York.
Edison, Jr., Electric Light and Power company, New York.
Electrical Appliance company, Jersey City, N. J.
Electrical World and Electrical Engineer, New York.
Electricity Newspaper company, New York.
Evans, N. R., Portland, Me.
Forbes, W. D. & Co., Hoboken, N. J.
Fayerweather & Ladew, New York.

- National Gramophone company, New York.
National Meter company, New York.
New York Electrical Equipment company, New York.
Northern Engineering company, New York.
Niles Tool Works, Niles, O.
Northern Electrical company, Madison, Wis.
New York Telephone company, New York.
National Association of Stationary Engineers, New York.
National Photographic Machinery company, New York.
New York Colortype company, New York.
New York Aluminum company, New York.
Orient Electrical company, Youngstown, O.
Ohio Electrical Specialty and Manufacturing company, Troy, O.
Puerto Rican Art company, New York.
Prindle Pump company, New York.
Paragon Fan Motor company, New York.
Pope Manufacturing company, Hartford, Conn.
Pittsburg Reduction company, Pittsburg, Pa.
Postal Telegraph-cable company, New York.
Pianophone company, New York.
Rockwood Manufacturing company, Indianapolis, Ind.
Roebling's Sons, John A., company, New York.
Risley-Bird Manufacturing company, New York.
Riker Electrical Motor company, New York.
Rex Fire Extinguisher company, New York.
Standard Steam Specialty company, New York.
Stirling company, The, Chicago.
Safety Insulated Wire and Cable company, New York.
Stanley Electrical Manufacturing company, Pittsfield, Mass.
Sayles, J. B., New York.
Smith & Egge, New York.
Thompson Press company, New York.
United States Supply company, New York.
Union Boiler Tube Cleaner company, Pittsburg, Pa.
Ullrich & Co., J., New York.

for April, 1898, a gain of 442. The number of patents, trademarks, prints and labels issued in April, 1899, was 2,143, as against 1,750 in April, 1898, being a gain of 387.

These figures indicate a healthy condition of affairs throughout the country, and it is gratifying to observe that the electrical fraternity participated largely in the results.

Street-railway Strike in Duluth.

(From the Minneapolis correspondent of the Western Electrician.)

The strike on the street-car system in Duluth, Minn., has resulted as so many strikes do—in violence and unbridled license. It began by cars being stoned and passengers and employes injured. Obstructions were placed on the tracks, and when the cars were stopped to clear the track they were greeted with stones which damaged the cars pretty badly at times. The strikers have been operating bus lines to take the places of the cars, and the company has been doing its best to keep the cars going. The final act of outrage attributed to the men was to blow up a car with dynamite, the front wheels being shattered. The motorman and the passengers were badly shaken up by the force of the explosion, but the car was running slowly and a tragedy was averted. The council will ascertain if the company is living up to its franchise, and, if not, will ask the court to compel compliance with the franchise.

Say When!

(President McCormick's address at the Chicago Commercial Club's dinner to Tesla.)

When the power of Niagara's thundering tide shall be moving the looms of New England; when "ships that pass in the night" shall telegraph messages to each other from distant horizons; when Tesla's "oscillator" shall be sending electrical currents from the top of the Alleghenies to turn the shafts of the Paris Exposition of 1900, etc.



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CONVENTIONS AND EXPOSITIONS.

- New York Electrical Exhibition, Madison Square Garden, New York, May 25 to June 3d.
Southwestern Gas, Electric and Street-railway Association, A. B. Texas, May 17th to 19th.
Chicago Electrical Association (annual banquet), Technical Building, May 17th.
National Electric Light Association, Murray Hill Hotel, New York, May 25 to 27th.
Exhibition of Electrical Appliances for Household Use, Brussels, Belgium, during May.
American Institute of Electrical Engineers, Boston, June 19th to 22d.
Canadian Electrical Association, Hamilton, Ont., June 25th to 27th.
American Telephone Association, Memphis, Tenn., July 5th.
American Association for the Advancement of Science, Columbus, Ohio, August 21st to 24th.
International Association of Master Electricians, Wilmington, Delaware, September 16 to 17.
International Exposition of American Manufacturers for Electrical and Mechanical Products, Under the Auspices of the American Institute of Electrical Engineers and the Franklin Institute, Chicago, September 16 to 17.
International Electrical Exhibition, Antwerp, September 16 to 17.
International Exhibition of Marine Electric, Berlin, Germany, September 16 to 17.
International Exhibition of Electrical Engineering, Chicago, September 16 to 17.

The National Electric Light association will meet at New York next week. Many important changes affecting the organization and its members have transpired since last year's meeting in Chicago. The intervening 12 months have witnessed many combinations and consolidations of rival companies, and in some respects, at least, these changes have been for the good of the industry. Rate wars have been stopped, and the electric-lighting business placed upon a paying basis. There have been other changes, however, the wisdom of which may be questioned. The industry is entering upon a new era and gives promise of still further expansion.

It appears that the English government is not to be outdone by this country in the matter of preparation for the establishment of a Pacific cable system. Following closely upon the announcement of the American government's determination to proceed with the preliminary survey of the route determined upon comes the news of a similar expedition under the direction of Great Britain. The British survey ship Egeria is now at Victoria, B. C., with specific orders to start at once surveying a route for the projected cable from Vancouver to Australia. British Columbia is rejoicing, as it is now taken as settled that the cable will be constructed. The Egeria will proceed to the British naval station at Esquimault, where she will provision and start for Fanning Island. The vessel is equipped with modern scientific instruments, and for 40 years has been engaged in charting the waters wherever British ships navigate. The present undertaking will occupy several years, it is believed, for the completion of the records.

Much interest has been displayed by electric-lighting station managers, especially throughout the West, in the attitude of insurance companies and fire departments toward users of acetylene gas. In France the use of the new gas has become even more general than in this country, and some curiosity has been expressed as to the regulations adopted for the protection of the community against explosions. An official investigation through the United States consular department reveals an interesting condition. The user of the gas must apply for a permit at the prefecture of the department in which he desires to operate his plant. This permit is obtainable without the slightest difficulty. If the machine is then installed within a building for which insurance is desired, an additional policy premium of 10 per cent. must be paid. If, however, the machine is located outside of the building, the insurance companies impose no additional tax. Rules for the construction and placing of the gas machines are not prescribed either by the local government or the insurance companies.

At the meeting of the Society of Mechanical Engineers at Washington a paper on "Standards for Direct-connected Generating Sets" was read by J. B. Stanwood of Cincinnati, and an interesting discussion followed, in which the urgency of the demand for the adoption of a recognized plan or system was plainly and forcibly set forth. As a result a committee was selected to confer with a similar committee from the American Institute of Electrical Engineers and co-operate with the latter in bringing about the desired result. It will not be necessary to impress upon electrical engineers, manufacturers and central-station managers the necessity for reaching an early settlement of this important subject. There has been much discussion upon this topic and there is evidently a strong tendency toward this line of thought which is spreading rapidly in the ranks of steam engineers. It was announced that in two foreign countries similar steps were being taken by dynamo and steam-engine builders with the view of retaining trade that Americans may wish to bid upon. This will, doubtless, be taken into consideration and assist in securing an early adjustment of differences. The steam engineers have shown a disposition to treat the subject in a spirit of candor and fairness which promises well for the early solution of the problem.

The National Electric Light association might appropriately take notice of the movement, as it was one of the first organizations to take up the subject

for discussion. At the last convention in Chicago President Insull directed attention to the subject in his annual address and urged the importance of the subject upon the attention of the members. Nothing has since been done toward formulating a plan, but now that the steam-engine men have signified a willingness to co-operate, it is probable that definite action will be taken.

At last Dr. Franklin is honored by a bronze statue in Philadelphia. The arrangements for the unveiling and dedication provide for rather a spectacular event, according to the Philadelphia Record, which says that "numerous kites of huge size will be attached to the canvas covering of the statue, and through the agency of these kites and by means of intricate electrical appliances the statue will be unveiled without any apparent human or mechanical assistance." Justus C. Strawbridge, who provided the funds for the statue, conceived the idea several years ago at a dinner, after listening to a speech in which it was pointed out that there was no memorial in bronze to Franklin in Philadelphia. The post-office pavement was selected as the site because tradition says that on that spot Franklin made his memorable experiment in kite flying, and in later years the University of Pennsylvania, of which he was the founder, was erected there. The statue is six feet six inches in height, and represents Dr. Franklin in a sitting position, holding a manuscript in the right hand and the left arm resting on the arm of the chair. The unveiling ceremonies were placed under the direction of the University of Pennsylvania by direction of Mr. Strawbridge. Franklin has an enduring monument in the Franklin Institute, but it is well that his memory should be cherished and his example impressed upon the youth of the country through individual agencies. Mr. Strawbridge is to be commended for his public-spirited undertaking, and the city of Philadelphia is to be congratulated upon this last acquisition to its public works of interest and historical significance.

Judging by the reports received from Germany lately a great deal of attention is being devoted to the subject of seasoning wood by electricity. One object of the electrical process is to expel the sap from newly cut timber and prepare it for immediate use by obviating all danger of cracking, shrinking or warping. It is also claimed that wood thus treated will last longer, as it absorbs much of the preservative compound in which it is immersed, and that an additional advantage is found in the tendency to increase the tenacity of the wood and its resistance to vertical compression.

The most successful of these processes depends upon the principle of electrical osmose. The electrodes in an electrolytic solution are separated by a porous partition, and when a current passes the volume of the liquid in contact with the positive pole diminishes, while that in contact with the negative pole increases. One of these, the Noden-Bretoneau process, which is now considered the most promising plan, is described as follows:

The positive pole of a dynamo is connected with a lead grating, upon which the wood to be treated is placed. A solution, which is kept at the uniform temperature of 100° F. by means of a steam pipe underneath the grating, is poured into the vat so as almost to cover the log of wood treated. At a public demonstration, the solution used contained 10 per cent. of borax, five per cent. of resin and three-fourths of one per cent. of carbonate of soda, the borax being used on account of its antiseptic properties and the carbonate of soda to help dissolve the resin. A porous tray, the bottom of which consisted of two sheets of canvas with a sheet of felt between, was placed over the log, and a sheet of lead connected with the negative pole of the dynamo was placed above this.

When the current is turned on the solution is drawn from the bottom and the sap is driven out, and its place taken by the borax and resin. The time required for a 10-inch log is about seven or eight hours, and then the wood is slowly dried, which takes in the open air in summer several weeks or even months. It was stated that a unit of electrical energy was required for every six cubic feet of timber treated.

It is reported that by the use of this process wood which has heretofore resisted every attempt at seasoning, such as marine pine, yields to treatment and can be made available like other timber. It has also been remarked that insects do not attack wood that has been electrically seasoned.

Tesla's Visit to Chicago.

Nikola Tesla's visit to Chicago and his published utterances have created a profound impression and have provoked no small amount of comment and criticism. Mr. Tesla came to this city as the guest of the Commercial Club of Chicago and delivered an address before that organization at the Auditorium, where a dinner was given in honor of the distinguished visitor.

The Commercial Club is a conservative organization, the membership being limited to 60 and composed of representatives of the leading commercial interests of the city. It was founded 32 years ago and has consistently adhered to the line of policy originally adopted. The dinner last Saturday evening at which Mr. Tesla was entertained was the 150th event of the kind in the history of the organization, and was therefore a red-letter day in the records of the society.

In addition to the members of the club there were several prominent men present by invitation, and a few electrical experts. Following is a list of those in attendance:

- | | |
|---------------------|----------------------|
| C. H. McCormick. | F. W. Blaisford. |
| Nikola Tesla. | C. H. Blatchford. |
| H. H. Kofskaat. | F. B. Peabody. |
| H. G. Selfridge. | W. J. Chalmers. |
| George B. Swift. | Franklin MacVeagh. |
| Edwin A. Potter. | Von Bismarck Plotke. |
| Melville E. Stooe. | Baroo Heyl. |
| W. G. Collins. | Robert Hotz. |
| C. H. Wacker. | Henry Favell. |
| F. S. Wieston. | E. M. Bartoo. |
| George E. Adams. | Professor Stevens. |
| T. C. Chamberlain. | R. N. Fowler. |
| A. V. Abbott. | F. H. Head. |
| Bruce Clark. | C. Hotz. |
| J. C. Whitney. | J. L. Houghteling. |
| Benjamin Allen. | C. E. Scribner. |
| Samuel B. Downing. | C. D. Craodall. |
| Byron L. Smith. | Eugene Cary. |
| N. B. Ream. | H. J. MacFarlaod. |
| Robert T. Lincoln. | D. C. Jackson. |
| C. F. Kimball. | W. H. Merrill, Jr. |
| John J. Janes. | Henry A. Knott. |
| Granger Farwell. | A. T. Evans. |
| Edward L. Brewster. | J. J. Green. |
| Marshall Field. | Henry N. Tuttle. |
| N. K. Fairbaok. | F. E. Drake. |
| A. S. Hibbard. | J. Hartley Bradley. |
| John M. Clark. | Edward B. Butler. |
| W. A. Fuller. | H. S. Carhart. |
| Victor F. Lawsoo. | John V. Farwell, Jr. |
| S. J. McPherson. | Arthur L. Farwell. |
| Edward B. Elliott. | Benjamin Carpenter. |
| Arthur D. Wheeler. | Marvin Hughitt. |
| H. H. Belfield. | John M. Whimao. |
| Carl Keith. | C. A. Lippicott. |
| E. G. Keith. | Ernest Proctor. |
| Henry Crew. | Charles Proctor. |
| A. F. Seiberger. | J. A. Spoor. |
| A. A. Carpenter. | H. N. Higginbotham. |
| H. Carus. | H. D. Higginbotham. |
| Rev. Dr. Nounao. | William T. Baker. |
| J. C. Zeublio. | Percy B. Eckhart. |
| James H. Eckels. | B. A. Eckhart. |
| James MacVeagh. | A. J. Earling. |
| C. W. Cormao. | Eugene S. Pike. |

At the conclusion of the dinner President McCormick addressed the company, saying:

"We shall be much interested to hear from Mr. Tesla of the realm in which he dwells, which seems to us so incomprehensible, and if we become puzzled at the relative importance of 'amperes,' 'volts,' 'ohms,' 'induction' and 'polyphase currents,' Mr. Tesla must remember that, although we may know more about other things, we are still in the primary class in electricity.

"Since this great force of nature has been made subservient to the will of man, electrical progress has opened a wide field for both capital and labor. The Commercial Club will be interested in knowing that in this country alone the capital employed in the manufacture of electrical apparatus is \$50,000,000; the telegraph interests represent \$100,000,000; the telephone systems \$10,000,000; while the investment in electric lighting is \$247,000,000; this statement does not include the electrical equipment for elevated or surface railways."

Mr. McCormick paid a compliment to Mr. Tesla and the work he has performed in this field, and predicted even greater results than those already accomplished.

Mr. Tesla's speech was rather disjointed and disconnected, due partly to the nature of the address, which was punctuated with experiments and side remarks, and partly to his apparent difficulty in expressing his ideas. He took particular pains to make himself clearly understood, however, and the members of the club were highly entertained, although it was evident that they were also greatly mystified by the lecture and the experiments.

"There is no one," Mr. Tesla said, "who does not speculate about the questions of his existence, asking whence he comes, whether he is going and what in reality he is. Soul and matter and their relations have eternal interest for human beings. On the other side, there is always the desire to comprehend the marvelous manifestations of nature in all its phases. Let us talk of all of these."

With such a flexible subject it is not to be wondered that Mr. Tesla strayed from the paths of electrical science frequently during the evening and indulged in much speculation. He spoke for a time of the two terms, animate and inanimate, saying that he could distinguish between them in common language, but that for the scientist the case was not so simple, and he illustrated his meaning by an ex-

periment with two disks, which he said were in-
larly constructed.

"One of these has life in it," he said, "and the other has not." Picking them up, he added: "Which is the active one I cannot tell, but we shall soon see." Then, while his assistant turned on a current, he tested each and determined which one was dead and which one was alive.

Then Tesla talked of the possibility of depriving a piece of iron of all its heat and energy until it had reached the absolute zero and the minimum of motion. "When the motion has ceased entirely," he said, "when the ultimate stage of condensation is reached, the matter would disappear. There may be going on in the infinite depths of space a process of appearance and disappearance of matter. We are working to test this by trying to reach the absolute zero. It may take centuries before we can reach this absolute zero, if ever, for the difficulties are very great."

Turning to another point, Tesla said: "It is necessary for us to assume a universal medium for the transmission of force. This results from the necessity of explaining the action of bodies at a distance. Energy is transmitted from the sun to the earth through some very attenuated medium. To show how such medium may be used under

Turning again to the question of life, matter, and dead objects, he said the two were not synthetic, but that the distinction was one of consciousness. He criticized the superficiality of the ordinary idea of life, saying that if our senses were keener we would entirely lose the feeling of individuality. He said that there were experiments which could prove essentially the question of the continuation of individual existence. But the experiments were impossible to perform. They would consist, he said, in demonstrating that an atom in the body behaved differently to one atom in the same body that toward atoms of the outside. He next described the stages in the appearance of life on the globe, saying that all life was originally generated in the water. Ranging all the way from the lowest forms of animal life to the most complex, he pointed out the impossibility of showing the exact point at which life can be said to appear. Then he discussed the distinction between the phenomena of cause and effect and phenomena which mystify us. He gave his hearers something to see, flashing light in vacuum tube with the aid of wires. Then he took a long tube in his hand and waved it like a flaming sword in the air before the machinery.

Describing many of the phenomena of his life and experience, he told how he had come to the conclusion that he was nothing else but an automaton in every act and sense. He explained how memory could be regarded as automaton, and told his hearers that some time he would write a philosophical treatise based on the facts he had observed.

"If I am an automaton," he said, "why should I not construct an automaton like unto me? What are the elements necessary? I am a heat-generating being, with powers of locomotion, with machinery to direct my movements, with a sensitive mechanism to provide data, and with a governing mind. My automaton must have all these qualities."

Mr. Tesla performed many of the experiments with which his name has been associated, showed his oscillator and explained its principle and operation, and then produced a model of a boat which he used to demonstrate in miniature his system of firing torpedoes and controlling the operation of machinery at a distance by means of electricity without connecting wires. In this connection Mr. Tesla recorded his claim to the invention of the system of "wireless telegraphy" with which Marconi's name is now generally associated.

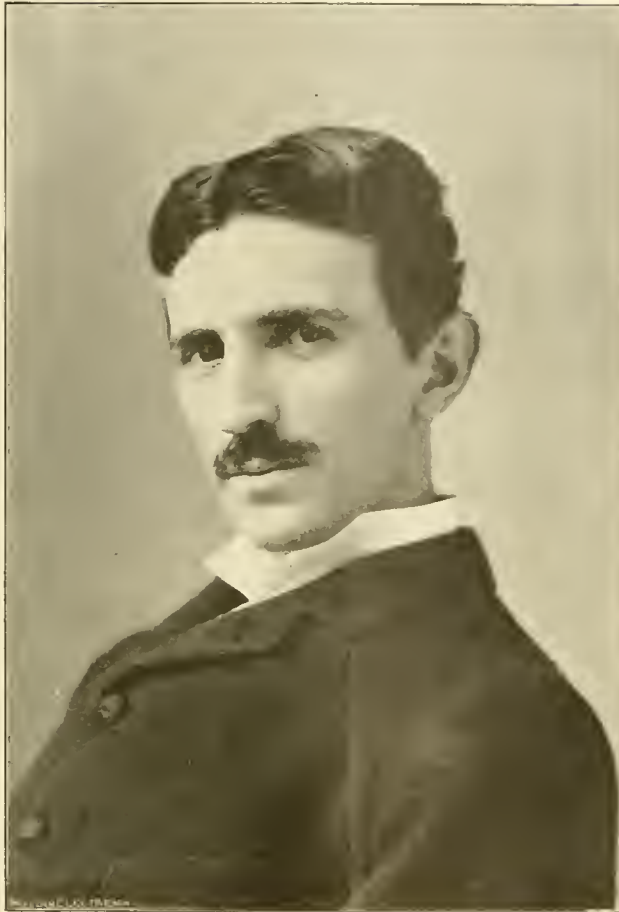
At the conclusion of his address Mr. Tesla was the recipient of many compliments from members of the organization. Much curiosity was shown over the apparatus employed, especially that used in directing the boat and exploding torpedoes. Owing to the lateness of the hour it was impossible to examine it closely. The electricians who were present refrained from commenting upon the exhibition and the apparatus employed, as they did not have an opportunity to go into the matter thoroughly.

On Monday morning the Chicago Tribune printed an interview with Tesla, in which he was quoted as saying that he proposed to establish communication between the earth and the planet Mars by means of an instrument so sensitive that it will feel disturbances created anywhere on the globe. Mr. Tesla pronounced this instrument "one of the most wonderful things I have discovered."

"The coming century," said Mr. Tesla, elaborating on his lecture before the Commercial Club, "will be the era of the atmosphere. From the moment I discovered that the air under certain conditions was a better conductor than a brass rod, I saw possibilities which made me grow fairly dizzy in their extent. The transmission of force and influence to any distance, the use of the sun's energy for all the needs of man, the possibility of controlling things with which there is no visible connection, these and an endless number of smaller achievements have become facts that in a short time will have their practical demonstrations."

"I am going on to perfect the needs of transmission of energy which I have found in the new and measureless ocean of the atmosphere about us. The sun has furnished us everything yet the energy it has to give is not used in the smallest part. The earth itself can be restored to the condition it was in when the ferns grew as large as trees. Disturbance in the new method of transmission, amounts to little or nothing. The idea of wireless telegraphy which arouses such interest now because it is developed to a new basis, is not wonderful at all compared to the principle of which it is an application."

The Rat Portage (Ont.) Lumber company has just put in operation an electric car system for delivering the lumber from the saws through its yards. It is a great improvement over the horse and cart service heretofore in use.



NIKOLA TESLA.

certain conditions I may refer to a feat I once accomplished of converting a column of gas into a solid body by the application of electricity in a certain manner. The gas became rigid and vibrated like a steel wire. Scientific men have not noticed the importance of this as yet. Again, I have produced a solid body in the air on the end of a wire. I made a flame which consumed nothing and which showed signs of solidification, for it offered resistance to the passage of bodies through it."

He then told of a method he had invented for the production of ozone, which could be made in commercial quantities for sterilization and for purposes of sanitation. It was made by the process he followed in the production of this flame which had the power of resistance.

"The forces of the air may be utilized in a manner now that we have not learned to even contemplate. Nitric acid may be made from the components of the atmosphere."

"This nitric acid may be made to fill our reservoirs and then utilized to produce the energy we need and to transmit energy to almost unlimited distances."

His greatest invention, he said, was in utilizing the forces of the air.

"The air, which is an insulator," he said, "becomes a conductor by means of the millions of volts I am able to produce. It means the using of the air for all purposes and uses of men. Not only for the transmission of messages without wires, but for the transmission of power in any amount to any distance across the earth's surface."

DEVELOPMENT OF THE TELEPHONE FIELD.

Radiophone at the Electrical Exhibition in New York.

[Special correspondence of the Western Electrician.]

New York, May 17.—A special matinee for the benefit of representatives of the press was given at Madison Square Garden last Saturday by the management of the Electrical Exposition, the attraction being the radiophone, which is the joint product of Professor Bell and Mr. Hammond V. Hayes of the American Bell Telephone company. This exhibition included a series of beautiful experiments in transmitting sound along a beam of light projected from an electric searchlight across the garden to a point 600 feet distant.

At one end of the garden, in the upper gallery, was placed an arc light with the familiar conical or parabolic, mirror of the searchlight behind it. When the current was turned on the beam was projected to the opposite end of the hall, where a simple receiving device had been placed. From each of the two main wires supplying current to the arc at the transmitting end short wires ran off to an adjacent telephone booth. Inside the latter was a transmitter.

At the receiving end the apparatus was even more simple in appearance. There was aimed toward the distant arc light another parabolic mirror—a bell-shaped vessel, whose lining was highly polished and whose interior curves were carefully calculated. A tiny bulb, no bigger than that of a thermometer, was fastened in the bell, at the focus of the parabola, and from this there extended back through the metal a short, slender glass tube, that connected with the ear-piece of a phonograph. There was no electrical equipment whatever at the receiving end. A visitor who put the twin rubber-tipped tubes into his ears heard not only the notes of a cornet, but also human speech, emanating from the closed booth at the other end of the hall.

This brief description will be sufficient to identify this system of "wireless telephony" with the apparatus exhibited by Professor Bell at the World's Fair in Chicago, although it is claimed that many modifications have been made, securing marked improvement.

Experiments on the transmission of speech by means of a ray of light were first made by Professor Bell in 1880, and he called the apparatus employed for the purpose the "photophone." The transmitter consisted of a plane mirror at the transmitting station, so arranged as to reflect a beam of light upon a selenium cell in circuit with an ordinary telephone receiver at the receiving station. The transmitting mirror served as a telephone diaphragm, a resonating chamber and mouthpiece being placed at the back. On speaking into the mouthpiece the mirror was vibrated, and these vibrations altered the intensity of the beam of light. The changes in the beam of light resulted in the selenium cell, acting in accordance with its well-known property of altering its electrical resistance under the influence of light, setting up corresponding changes in the receiver circuit, and so producing vibrations in the receiver diaphragm similar to those communicated to the mirror of the transmitter.

Professor Bell's experiments aroused much interest and discussion in the scientific world, and when it was found that the selenium cell could not be relied upon, as its sensitiveness to light changes with age, a very simple receiver was substituted. This receiver consists simply of a glass bulb or tube, containing a small pellet of carbonized fiber. To the opening of the tube is connected an ordinary phonograph ear-tube, and this simple device is all that is required for the photophonic receiver. Further investigation of the action of Professor Bell's invention determined that it was really due to heat effects, and not to light. Mercadier proved that the results obtained were due to heat effects, and suggested the name "radiophone" as more appropriate than "photophone." Hammond V. Hayes, of the technical staff of the American Bell Telephone company, found that, using a mirror and a reflected beam of light, as in the experiments of Professor Bell, the transmission of speech was extremely feeble, and audible to a trained ear only, and he at once began an investigation.

It was found in experimenting with an arc light as the source of the transmitting beam that a noise was heard in the receiver, which was traced to the inductor of the generator to which the lamp was connected. This experience pointed directly to a new style of transmitter. Experiments were made to find a means of directly varying the heat radiated by an arc light in such a way as to cause the light rays to vary to the radiophone receiver the same as the numerous ways of reaching the selenium cell. The simplest and most efficient method discovered being the one used in present practice. That is to connect in a shunt circuit with the telephone transmitter specially designed for a large amount of current. By increasing the current in the arc light the resistance of the transmitter, of course, varying with the temperature of the diaphragm, and the intensity of the current of the arc light, produces corresponding changes in the heat radiated by it, and these

changes affect the material in the glass bulb of the receiver in such a manner as to produce minute variations in the column of air contained in the receiver and ear tubes.

It has not yet been determined how far speech can be transmitted in this way, the distance naturally depending largely upon the power of the light used at the transmitting station. No experiments have yet been made to determine the limits of transmission under the most favorable circumstances, but as an indication of future possibilities it may be said that in Mr. Hayes' experiments in Boston he has succeeded in transmitting Morse signals by means of the radiophone over a distance of two miles.

Michigan Lines.

[From the Detroit correspondent of the Western Electrician.]

The main office at Detroit of the Michigan Bell company now has over 4,000 subscribers, the branches 2,600, making 6,600 in all in the city. Each branch office is now complete in itself, with operating and repair departments, so that calls from branch to branch are not delayed by passing through the main office.

An important change will be the removal of 60 toll lines from various parts of the city to a common station on the Six Mile road, whence they will traverse the state. This will allow the toll service to be handled over a general route with less delay and less of the retarding influences of underground currents. It is expected that the change will greatly improve long-distance work.

Out in the state, the Bell company is now actively engaged in connecting Detroit with Mackinaw, Marquette, Houghton, Calumet and Menominee, and in less than two weeks 2,000 men will be at work on these new state lines. Manager Forbes stated that he would eventually connect Detroit with every cross-roads place in the state. All state lines are being transformed into metallic circuits, so that long-distance telephones will be in use everywhere.

The Detroit Switchboard and Telephone Construction company has just completed a 3,000-line switchboard for the new People's Telephone company of New Orleans, and has accepted a contract for building a 5,000-line switchboard for the Allegheny (Pa.) Telephone company, the latter contract amounting to \$120,000. Superintendent McLeod of the Detroit Switchboard company says that the New Orleans exchange has five-year contracts with 3,000 subscribers, and a 25-year franchise, with rates fixed at \$36 to \$40 a year. Over 200 electrical workers are now employed at the Detroit plant.

Control of Wisconsin Telephone Company in New Hands.

[From the Detroit correspondent of the Western Electrician.]

C. J. Glidden and his associates, who control the Michigan Bell Telephone company, have secured a similar interest in the Wisconsin company, and the control of the North and South Dakota, Cleveland and Southwest Telegraph and Telephone companies, with a list of 80,000 subscribers. In Michigan and Detroit the new owners are expending large sums for improvements.

The syndicate which Mr. Glidden represents comprises the Erie Telephone company, which is formed to invest in Bell securities and build up properties of this character. The company is at present interested in a large portion of the telephone exchanges of the Bell system, and it is extending its operations in all directions.

Attempted Theft of Telephone Cable.

Three boys were arrested in Brooklyn last week for attempting to run off with about 500 feet of telephone cable belonging to the New York and New Jersey Telephone company, resulting in seriously crippling the service of the Bedford exchange for a couple of hours. They climbed up on the structure of the Brooklyn elevated railroad in Grand street, between Myrtle and Willoughby avenues, and proceeded to cut away about 500 feet of the telephone cable which is strung along under the structure. The street is dark at this point, and no one saw the boys at their work, but the falling of the heavy cable into the street aroused some of the people in the neighborhood. They came out and saw the three little fellows trying to roll the cable into a bundle, so that it could be carried away. When discovered, the boys took to their heels, but they were arrested later. The wire which was cut connected the main telephone exchange with the Bedford exchange.

Mexican Telephone Project.

President Diaz of Mexico has refused to charter a long-distance telephone company on the ground that the service would injure the business of the Mexican telegraph system. The stockholders of the Mexican Telephone company held their annual meeting at the Astor House, New York, May 10th, and decided to try to secure rights to use the telephone, not only in Mexico, but between the United States and Mexico.

Telephone News from the Northwest.

[From the Minneapolis correspondent of the Western Electrician.]

The Clarinda, Ia., telephone exchange has 145 patrons.

The Fort Dodge (Ia.) Telephone company has increased its capital stock from \$15,000 to \$25,000.

The Overland Telephone company is constructing a telephone exchange in Melrose, Ia.

The Ogden (Ia.) Telephone company is about ready for business. Work will be begun on the exchange at once.

The City Council of Clinton, Ia., has ordered the telephone and telegraph companies doing business in the city to be assessed. This is the first local attempt to assess such companies.

The Long-distance Telephone company is working to establish a telephone system in Hedrick, Ia.

T. Dupuis & Son contemplate establishing a telephone exchange at Washington, Ia.

The telephone operators of the Chippewa Valley Telephone company at Chippewa Falls, Wis., struck for higher wages. Foreign talent was imported and their places filled.

F. L. Eaton, T. H. Johnson, R. M. Dott and F. W. Lohr have an option on the Home Telephone company of Sioux City, Ia., with an exchange at Vermillion, S. D., and 225 miles of toll lines in South Dakota and Iowa, as well as the exchange in Sioux City. It is understood the prospective owners will wage relentless war on the Bell interests in Northwestern Iowa and Nebraska and South Dakota.

The Wisconsin Telephone company will entirely rebuild its system at La Crosse, Wis., and the toll lines in the vicinity at a cost of \$12,000 to \$15,000.

The Citizens' Telephone company of Montevideo, Minn., has been organized and has contracted for equipment which is to be installed as rapidly as possible.

The Princeton (Mo.) Telephone company contemplates establishing a telephone exchange in Centerville, Ia.

Owing to increasing business the St. Croix Valley Telephone company will string an additional wire between Balsam Lake, Wis., and St. Croix Falls for the use of business houses exclusively.

Dickhoff & Jaehning of New Richland, Minn., and the Minnesota Central Telephone company made ineffectual attempts to put in a telephone exchange at Redwood Falls, Minn.

The Iowa Telephone company is about to add another section to its switchboard at Fort Dodge, Ia., to contain 100 drops.

The new telephone exchange in Benson, Minn., is in running order.

Sioux Rapids, Ia., will vote June 5th on granting a franchise to the Sioux Rapids Telephone company.

The Wausau (Wis.) Telephone company has ordered a new switchboard of 400 drops.

The Central Telephone company has installed an exchange at Pomeroy, Ia.

The Zenith City Telephone company has secured quarters in Duluth, Minn., for its exchange room. Much of the materials for the system have been purchased and work is to be rushed.

The Lake Park and Ulen Telephone company has been incorporated at Lake Park, Minn., to build a line to Ulen.

The Minnesota Central Telephone company has arranged with the new Citizens' Telephone company at Montevideo, Minn., so that the entire local telephone exchange business will be turned over to the new company.

The Northwestern Telephone Exchange company will make a number of improvements to the system at Faribault, Minn.

M. R. O'Neill of Graceville, Minn., has obtained a franchise for a telephone exchange at Appleton, Minn.

George E. Merrill has been granted a franchise for a telephone exchange at Verdale, Minn.

The Iowa Telephone company is working hard on improvements to its lines in Iowa this spring. A metallic circuit is being constructed between Burlington and Ottumwa and a similar one between Denison and Missonri Valley. The Clear Lake Independent Telephone company has been incorporated at Clear Lake, Ia., with \$3,000 capital stock.

The Sterling-Amboy Telephone company has been incorporated to build a line from Sterling Center, Minn., to Amboy.

Chicago Telephone Company's Extensions.

The Chicago Telephone company, it is understood, will build a new North Side exchange on Chicago avenue. That corporation has purchased from Arthur D. Wheeler a tract of 60 by 100 feet on the north side of that avenue, 168½ feet east of Clark street, for \$21,500, and it is believed that it will eventually serve as a site for a new building which the company will occupy. In the same connection Mr. Wheeler purchased, on April 11th, from E. P. Baker 40 by 100 feet of south frontage on the same avenue, 90 feet west of Dearborn avenue, for \$13,500, and from Angeline A. Cook 20 by 100 feet, adjacent, for \$8,000, both tracts being included in the sale to the telephone company.

Theory of Wireless Telegraphy.

An interesting contribution to the theory of the vertical conductor appears in the Comptes Rendus de l'Association Francais pour l'Advancement des Sciences, in a communication made to the association at Nantes by M. Blondel, which has been summarized by the London Electrical Review, as follows:

M. Blondel remarks that it is no longer possible to look upon wireless telegraphy as Hertzian waves radiating from the spark gap of the transmitter, since Marconi has shown that the range is so enormously increased by the use of "antennae" (the name which he applies to the vertical conductors) with earth connections. It is necessary, then, to attribute the principal effect to an oscillating system, in which the capacity of the transmitting antenna in relation to the earth comes into play.

This antenna and the earth play the part of the two plates of a condenser, which is charged by the coil and becomes the seat of an oscillating current when the spark passes across the air gap. Owing to its position lines of force radiate like a fan in all planes from the antenna to the earth. The displacement currents, produced by the oscillating electromotive forces along the lines of force, are consequently concentrated in a limited space around the antenna, but the Hertzian waves produced by them around the antenna spread straight out into space. The oscillations in the wire are not themselves utilized, but they give birth to those which are utilized by causing a disturbance in the surrounding ether. The direct radiation from the antenna and the earth is very intense, but is quickly damped out, and that, in Blondel's opinion, is the reason why it has hitherto been found impossible to establish resonance between the transmitting and receiving antennae.

The important role played by the capacity of the antennae appears to be supported by the following experimentally ascertained facts:

- (1) The range attained when the antenna is not connected to the earth is comparatively insignificant.
- (2) The range depends upon the height of the antenna and not upon the oscillator.
- (3) The character of the spark changes when the oscillator is put to earth; from being long and slender, it becomes short and thick.

It would appear, therefore, that the capacity of the antenna will determine the length of the waves; the latter is sufficiently great relatively to the height of the antenna as to make it admissible to assume as a first approximation that the oscillating electric current along the conductor is sensibly the same as in the wings of a Hertzian oscillator.

This being granted, it is easy to see that the role of the transmitting antenna is twofold:

- (1) In the first place, it regulates the intensity of the center of disturbance by augmenting the volume of ether disturbed by the oscillator. In fact, the lines of force, being displaced with the same rapidity in the air and along the wires, and abutting always normally on the conductors, according to the known properties of electric oscillations, ought to have the form of hemispherical sheets, diverging from different points of the antenna and abutting normally on the ground. At each discharge they stir up the surrounding ether like the pulsating hemispheres of Bjerkness. The higher the antenna, the greater is the pulsating sphere, the greater is the volume of ether disturbed, and the greater is the distance at which the disturbance is perceptible. It may, therefore, be asserted that the antenna determines the volume of disturbance at the transmitting station.
- (2) In the second place, the antenna directs the magnetic lines of force produced in the direction calculated to produce the maximum effect on the parallel antenna at the receiving station. The magnetic lines of force are horizontal circles concentric with the antenna, and expand horizontally into space till they strike the receiving antenna at right angles, and generate oscillations which affect the coherer at its base. This favorable result is not obtained except the antennae are parallel.

The antennae, it is true, may be placed parallel without being vertical; for instance, they may be horizontal, with a spark gap at the center of the transmitter and a coherer at the center of the receiver. The arrangement is then similar to that of Hertz. The volume of disturbance is still determined by the length of the antennae. But the neighborhood of the ground introduces a disturbing influence, because the magnetic lines of force, instead of moving parallel to the earth, cut it at right angles during their propagation, and generate currents which involve a considerable loss of energy, and rapidly enfeeble the waves. Vertical antennae are, therefore, much to be preferred.

It is, easy to reduce this problem to that of the Hertz oscillator. Let us suppose that the earth, which here plays the part of a conductor along which the waves glide normally, is replaced by a thin metal disk of perfect conductivity. Hertzian waves, whatever their form be, will give place to superficial currents in the wire forming the antenna and in the upper surface of the disk. Let us suppose that an image in the disk of the antenna, fitted with an oscillator having a synchronous equal and opposed electromotive force, is set in operation below the disk. It will produce on the lower surface of the disk superficial currents which exactly annul those due to the real antenna. Everything will

happen, therefore, as if the disk of the earth did not exist, but only the two opposed antennae, the combination of which forms exactly a Hertz oscillator. Hence the conclusion that the combination of a transmitting antenna and the earth (supposed to be a perfect conductor) is equivalent to the half of a Hertz exciter of double the length and potential. The same reasoning shows also that the combination of a transmitting antenna and the earth is equivalent to a rectilinear resonator of double the length, in the center of which a coherer is interpolated.

Following Poincaré in assuming that the current in the antennae is uniform, and applying the formula of Neumann for the mutual induction of oscillating currents, the current induced in the antenna of the receiver is simply proportional to the coefficient of mutual induction (M) of the two antennae, and to the variation (d i) of the current in the receiving antenna.

The effect produced on the receiver will, therefore, be of the form $\frac{H H'}{r} \frac{d i}{d t}$ where H and H' are the heights of the antennae and r is their distance apart.

Experiments appear to confirm this approximate law of proportionality to the product of the heights. But it must not be forgotten that an increase in the height of the transmitting antenna increases its capacity, and, therefore, reduces the frequency of the oscillations, and also the difference of potential at the terminals of the induction coil. The factor $\frac{d i}{d t}$ is thus reduced.

The theory is only approximate, and neglects the loss of energy due to the earth being an imperfect conductor. This theory in Blondel's opinion explains why the range of transmission is greater over sea than over land.

Government Experiments with Wireless Telegraphy.

Mention has been made of the experiments conducted by Signal Corps officers with the view of introducing wireless telegraphy into the army and navy service. On May 11th General Greely published the result of this investigation, which is appended:

Since the announcement of the tests in space telegraphy by Signor Marconi two years ago, the subject has been under consideration by other scientists employed in the States, and recently experiments have been begun with the object of thoroughly testing the value of this means of communication for military and other governmental purposes. Special apparatus has been assigned and constructed for these tests, which have already shown sufficient promise to warrant further and systematic trials. In view of the great public interest and in order to facilitate experiments by other scientists in the States, it is deemed proper to put forth this statement of operations to the present time.

Transmitter.—In the experiments thus far several forms of transmitters for the generation of the Hertzian waves have been used, and much promise has been realized from the use of a large alternating-current coil in oil as a generator, instead of the ordinary Ruhmkorff coil employed by Marconi. This coil is energized by a three-quarter horse power rotary transformer, furnishing 125 volts alternating potential, and this arrangement makes a very powerful and efficient source of Hertzian radiation.

Receiver.—The former receiver used has been substantially the Braokey "coherer," discovered in 1891, and the signals transmitted are recorded upon a receiving tape.

The transmitter, being mounted on the west elevation of the Signal Corps building, and the receiver on the west elevation of the Signal Corps building, utilizing the present wooden flagpole for the vertical wire for the transmitter. The receiver was first placed at the old Naval Observatory grounds, about three-quarters of a mile distant, and later moved to the Signal Corps station at Fort Myer, Va.

During the experiments constant communication by heliograph and flag between the transmitting and receiving stations has been kept up by the trained men of the regular Signal Corps, and this has greatly facilitated the work of experimenting. Signals, letters and words have been transmitted and received between these stations, but the great delicacy and constant adjustment required in the present receiver have made the transmission of regular messages as yet unreliable and uncertain.

The presence of large buildings and masses of iron and steel nearby, and the presence of such places undesirable for carrying on experiments of this character. The distance over which signals may be transmitted by a given apparatus is a function of the height of the vertical wire used at either end, and this has naturally suggested the use of small gas balloons, such as have already been used for signal and other purposes by the Signal Corps. A supply of these balloons has already been obtained and will be used for this purpose in the near future.

That there is a field of usefulness for space telegraphy is undoubted, but that it will supplant to a material extent the use of wire for ordinary commercial telegraphy is not believed. Its value for communication between lighthouses and lightships and the shore, at points where cables cannot now be permanently maintained, will be great. For signaling between ships at sea and to replace ordinary flag methods in use between naval vessels it should prove invaluable, since no kind of weather, neither fog, darkness nor storm, avails to affect its use.

The use of metal reflectors to augment and direct the radiation to particular points has already met with partial success and should be thoroughly investigated. At present the radiation proceeds from the transmitter in all directions and the same message can be received at any point within the proper radius at which a receiver is placed. A satisfactory reflector and a receiver of the proper electrical capacity, or, in other words, tuned to the vibrations of the particular transmitter, would make a great advance in space telegraphy and do much toward the extension of its field of practical usefulness. While secrecy of transmission is among the probabilities, the present stage of experiment does not justify its positive prediction.

SPACE TELEGRAPHY.

In the Illustrated Electrical Patent Record this week a new patent granted to Marconi for wireless telegraph apparatus is illustrated and the inventor's claims summarized. The invention is a modification of a former patent granted Marconi July 13, 1897.

The Lighthouse Board announces that experiments will be undertaken at the headquarters at Tompkinsville to test the Marconi system of wireless telegraphy. The test will be made between the Tompkinsville central station and one of the lightships. For many years the officers of the Lighthouse Board have been desirous of getting some means of communication between the lightship and the central station, to take the place of the present system, which is felt to be inadequate for the recent developments in range. The officers have led them to look into Marconi's system.

Mr. Arthur Vaughan Abbott, chief engineer of the Chicago Telephone Company, delivered an interesting address on 'Wireless Telegraphy' under the auspices of the Y. M. C. A. Electrical Club of Chicago on Friday evening, May 12th. Mr. Abbott explained the nature of the experiments conducted by Marconi and gave a brief history of the development of the branch of telegraphy. He performed some very interesting experiments demonstrating the practicability of the system within limits of the lecture room and explained the essential features of the instrument employed. The address proved instructive and entertaining and was highly appreciated.

The Prince of Wales presided over a dinner in aid of the London Lifeboat Saturday Fund recently, and in the course of a speech on the work of the Royal National Lifeboat Institution he referred to the subject of electrical communication, saying:

One of the most important indirect means of aid to the institution with a view to diminishing the loss of life from wrecks on the coast has been to procure from the Government a system of electrical communication between rock light stations and light vessels, etc., and the shore; also between the coast guard stations and light vessels, and the post offices nearest the life boat stations where there are no coalstead stations. This useful work was commenced in 1893, and steady progress has been made in every year, and it will, it is hoped, before long be completed. The royal commission which was appointed at the suggestion of the institution in 1893 sat for four years during which time they issued five reports, the fifth and final report being issued in the autumn of 1897. The most important recommendations of the commission have already been carried out but in their last report they felt bound to state that they did not feel justified in recommending the connection of more light vessels and the shore than those they had proposed until the etherial system then under trial had been fully tested. I understand that these tests have been satisfactory, and you have all doubtless seen in the press the accounts of the remarkable and successful experiments which have recently been carried out in connection with wireless telegraphy under the superintendence of Signor Marconi, the inventor, which would seem to solve the great difficulties which have been encountered in the effort made to complete so important a system round our coast. I should think, likewise, the use and importance of the telephonic and telegraphic connections which have been established by the institution, and the utility of which each year has been increasingly demonstrated, they being more and more employed for calling out lifeboats when required, for preventing unnecessary launches, and for warning lifeboat crews to be on the alert to render assistance.

Mr. Kang Investigating Electrical Plants.

From the Canadian correspondent of the Western Electrician.

Ottawa, Ont., May 13.—Kang-Yu-Wei, the exiled Chinese reformer, who is at present visiting the Canadian capital, appears to be greatly interested in electrical development. In company with street-railway officials, he paid a visit of inspection this week to the power house of the Ottawa Electric Company at the Chaudiere Falls there. The oriental politician was accompanied by his two secretaries, who made extensive notes of the information gained. The distinguished visitor manifested great interest in the various details and workings of the machinery. Kang-Yu-Wei is desirous of promoting electric interests in his native land, and on his return from the present exile will make use of the pointers he has secured on his travels. Outside the treaty ports Canton is the only Chinese city that has an electric plant, and this one is but an imperfect affair. The Chinese reformer secured from Messrs. Ahern and Soper of Ottawa estimates on the probable cost of an electric-lighting plant for Canton. Kang-Yu-Wei is very much impressed with Canadian railways, both steam and electric, and has intimated that if he ever attains to power again in China it is his purpose to promote a railway policy along the same lines.

A Question of Re-entry.

Some time since George F. Chase of Detroit exported to Canada a dynamo and two hoisting machines of American manufacture. He lately inquired of the Treasury Department as to his right to import the same machines free of duty, although the dynamo has been rewound and the other machines repaired by the addition of new parts in Canada, the work being performed by men from the United States and the material used in rewinding repair and fittings being all of the manufacture of the United States.

Paragraph 483 of the tariff act of 1897 provides for the free entry of "articles the growth, produce and manufacture of the United States, when returned after having been exported without having been advanced in value or improved in condition by any process of manufacture or other means, which shall have been actually exported from the United States; but proof of the identity of such articles shall be made, under general regulations to be prescribed by the secretary of the treasury."

In the opinion of the department, it is immaterial whether the repairs or improvements in condition by any process of manufacture or other means are made abroad by means of American labor and materials or foreign labor and materials, and the fact having been shown that the dynamo and hoisting machines were advanced in value by any means while abroad, free entry thereof could not be accorded on importation.

One Result of Industrial Combinations Illustrated.

[From the Washington Post.]

The first of many changes to be made in the management of the syndicate properties in Washington concerns the clerical forces of the United States and Potomac Electric companies. The executive affairs of the two lighting companies have been brought together, the principal office being located at 1417 G street, headquarters of the syndicate, while the clerical force will hereafter be at the office of the United States company, Fourteenth street and Ohio avenue. L. E. Sinclair, former superintendent of the Potomac plant, has been given the same position with the consolidated concerns, and E. S. Marlow, former cashier and treasurer of the United States company, is made soliciting agent of the two companies. W. S. Terry, formerly bookkeeper of the Potomac company, is made auditor of the combination, and the offices of president, secretary, treasurer and cashier of the United States company have been abolished. It is estimated that the saving accomplished in the reduction of the office and mechanical force will be in the neighborhood of \$12,000 annually.

This reduction in the number of employees is the natural consequence of the syndicate consolidation. When all the properties are formally brought under the one management there will be still further and more important reductions in the working forces, the effect of which will surely be felt. Of the 12 railroads controlled by the syndicate, the mechanical and office forces will virtually be made one. This will result in the doing away with as many presidents, secretaries and superintendents, general man-

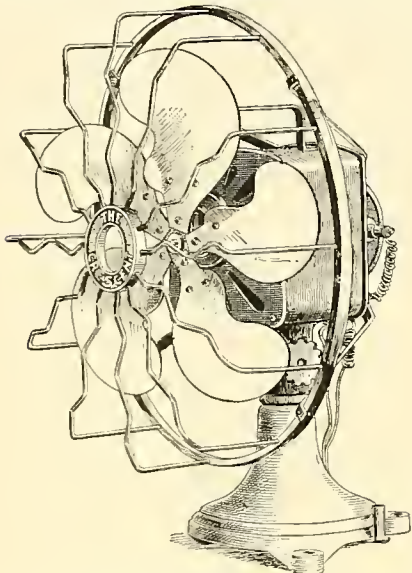


FIG. 1. CRESCENT FANS.

agers and other salaried officers, and the formation of one staff for the control of all the properties. The roads, however, will retain their present identity and will not, according to present plans, be run as one line. The clerical force will probably be brought to the offices of the City and Suburban and Anacostia lines, over the West End National Bank, on G street. These changes will result also in a vast saving in the operation of the various roads. With such reductions and the savings that will follow the doing away with many of the railway power plants the economies resulting will, it is believed, amount to probably not less than \$500,000 annually.

Substantial Marine Generating Set.

In the design of the generating set illustrated herewith the features of compactness, accessibility, economy and stability, with consequent lightness of parts and ability to maintain an excessively high rate of speed during a long period, have been most carefully developed.

The engine is two-cylindere, the cylinders having their axes parallel and being contained within the same casting. The diameter is very large relatively to the stroke, the size represented being nine-inch cylinders with 5½-inch stroke. The valves, which are of the piston type, are two in number, placed in tandem between the cylinders, and actuated from a crank below, which in turn receives its motion from a crank above from the eccentric.

The valves, which operate in unison, are so designed that steam is coincidentally admitted to the top of one cylinder and the bottom of the other. The motion of the piston is transmitted through large piston rods to slipper cross-heads, and thence through marine-type connecting rods to the double crank below.

The crank pins are set at an angle of 180 degrees, so that the vertical action is balanced, one crank moving upward as the other moves downward. This feature is instrumental in the securing of a high rate of speed.

The cylinders are supported upon four heavy col-

umns, as shown, the rear columns supporting the guides for the cross-heads, and all being securely bolted at the bottom to the very substantial bed casting. This bed carries three main journal bearings, brass bushed in their lower halves, and provided with continuous oiling devices in connection with oil receivers beneath. The interior of the bed forms a basin which collects all drip from water or oil.

The regulator is of special construction and arranged to operate the valve in such a manner as to regulate the point of cut-off for all loads. It is said to be exceedingly powerful, although sensitive to very slight changes in speed.

The connecting rod and cross-heads are of forged steel; the cylinders are thoroughly lagged, and an oil tank is mounted upon each end of the cylinder casting and provided with individual sight-feed oilers and connections to the various bearings.

The generator, the armature of which is coupled to the engine shaft, is carried upon a continuation of the engine base, and is of the six-pole type, with outboard, ring oiler bearing. Its capacity at 425 revolutions per minute (the speed of the engine) is 40 kilowatts. The field ring is of cast-steel. The cores are of wrought-iron with cast-iron shoes.

The armature is built upon a spider, and ar-

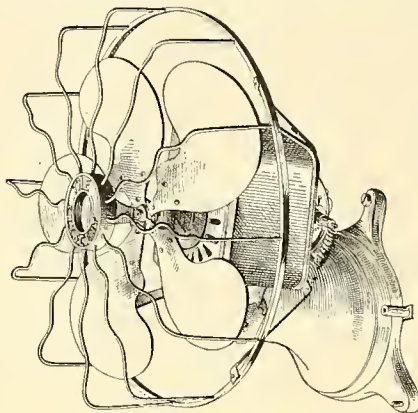
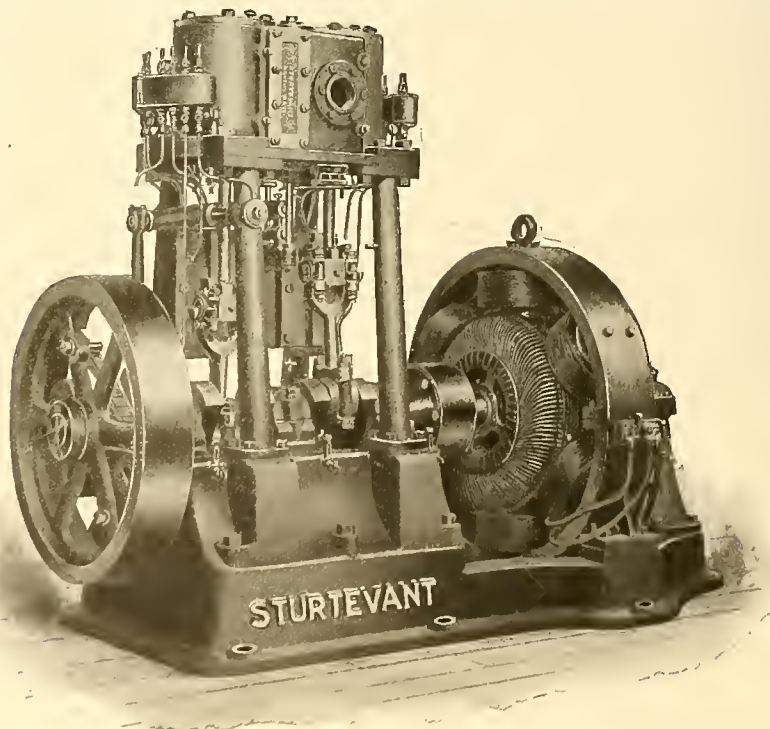


FIG. 2. CRESCENT FANS.

ranged for thorough ventilation through internal ducts extending out through the armature windings. The armature in operation acts as a blower and causes the passage of air through these ducts.

The series winding of the field coils is of flat copper ribbon, and the shunt winding is of wire. Both windings are placed on the pole entirely independent of each other, and either may readily be removed. Their design is such as to permit of free circulation of air upon all sides.

The generator is designed for sparkless operation



SUBSTANTIAL MARINE GENERATING SET.

under all changes of load from no load to 25 per cent. overload, with a limit of temperature rise of 60 degrees Fahrenheit after full load run of 10 hours.

This set was designed by the B. F. Sturtevant company of Boston, Mas., and is one of a considerable number of types which are now being manufactured by that company.

Crescent Fans.

The accompanying cuts show several styles of a variety of the Crescent fans, designed by Manager D. H. Kulp, and manufactured by the Marietta Manufacturing company of Marietta, Pa. These fans possess features of value to buyers of such goods. After considerable experiment, the Marietta company states it has secured a fan wing which will positively eliminate the humming noise which has heretofore caused so much annoyance, at the

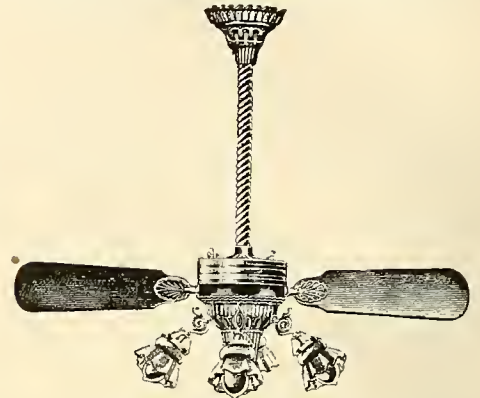


FIG. 3. CRESCENT FANS.

same time increasing air displacement. Former types of desk fans have been abandoned, and the company has adopted a more efficient and ornamental construction, which experience has suggested advisable.

All desk fans (Fig. 1) will be provided with universal joint, readily adjusted to any position, also a neat and unique hand-hold on top of motor for convenience of moving from place to place. This type of motor will be furnished for all voltages on direct incandescent circuits. Three-speed regulators are provided on all desk fans up to and including 230 volts with no extra charge.

Fig. 2 represents type G Crescent fan for bracket use. The regular desk fans of all sizes and voltages are furnished with the swivel joint. It therefore becomes necessary to have extra attachments. The advantage of this can readily be appreciated. But no extra charge is made for this attachment.

In Fig. 3 is illustrated a type of Crescent direct-current fan of the electrolier type, with four lamps.

It is a matter of interest, particularly to the western trade, to know that the Marietta company recently shipped to its exclusive western agents, A. Reiman & Co., 817 Market street, St. Louis, as many as 2,500 of the Crescent fans. Such a shipment as this not only speaks for the favor Crescent fans have found in the West, but, as more are

to follow, insures the trade of enough stock in St. Louis to take care of rush orders.

The Raritan Electric Light and Power company, Perth Amboy, N. J., is said to have been sold to a syndicate supposed to be identified with the People's Light, Heat and Power company of Newark.

Eureka Central-energy Generator.

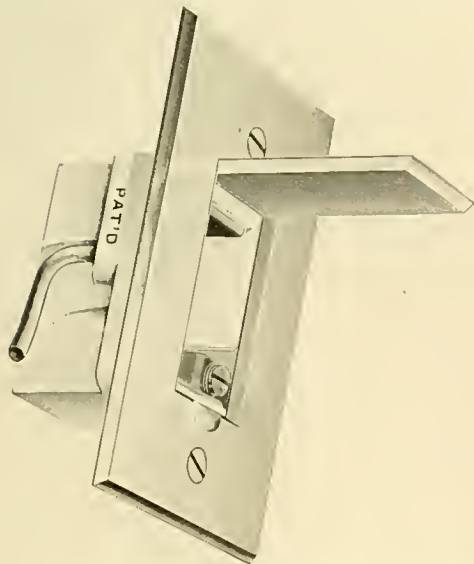
The Eureka Electric company of Chicago is now placing upon the market what is known as the Eureka central-energy generator. This apparatus is designed to meet the need of a practical, reliable machine, to take the place of hand generators in telephone exchanges. It is especially adapted for exchanges where water power cannot be secured or where the cost for power for operating power generators is such an item as to make it of consequence to secure something more economical but still in no way inferior.

Power generators, up to this time, have been used almost entirely to fill such requirements for furnishing energy from the central station, except the exchanges that have used the slow method of the hand generators. The special object of the Eureka central-energy generator is to fill the requirements of a device that shall prove reliable, efficient and economical, and be ready for service day and night, requiring no attention whatever, excepting an occasional recharging of four cells of sal-ammoniac battery. These four cells (of any ordinary type of sal-ammoniac battery), connected to the machine, give sufficient voltage and output by the closing of the circuit, which is done by a cam lever upon the switchboard, by the use of a foot-push, which is furnished with the machine. They will, it is claimed, throw sufficient current to the lines to enable the machine to ring the bells over lines having resistance as high as 100,000 ohms.

These generators have been thoroughly tested, and the company has received quite a number of endorsements from exchanges using them, which will be furnished to prospective purchasers or others interested. The machine is covered by fundamental patents. The great economy to be considered in the installation of the Eureka central-energy generator is the fact that all the expense and attention necessary is the recharging of four cells of sal-ammoniac batteries once or twice a year, according to the service exacted of the machine. One of the advantages of this generator is that it is consuming no current whatever, except when signaling a subscriber. The instrument is adapted for either series or bridging lines and for any size exchange, from 25 subscribers upward. The size of the machine is 10 by 12 inches, and it can be placed in a small space, wherever it is convenient, either at the switchboard or away from it.

The Pringle "New Style" Receptacle and Attachment Plug.

When William T. Pringle of Philadelphia introduced, a few years ago, the now well-known Chapman receptacle and plug, to quote his own words, he "was laughed at;" the idea was ridiculed. It was too expensive; it would never "take." However, Mr. Pringle felt confident it would "take" when placed before the public, and the results have exceeded his expectations. Many thousands of these plugs are now in use; they have found favor, and are growing in popularity daily. A great many of the large buildings in prominent cities have installed them,



FIGS. 1 AND 2. THE PRINGLE "NEW STYLE" RECEPTACLE AND ATTACHMENT PLUG.

and throughout the country the demand is increasing.

But there were a few deficiencies in this device that have been finally overcome. The "new style" is shown by the cuts.

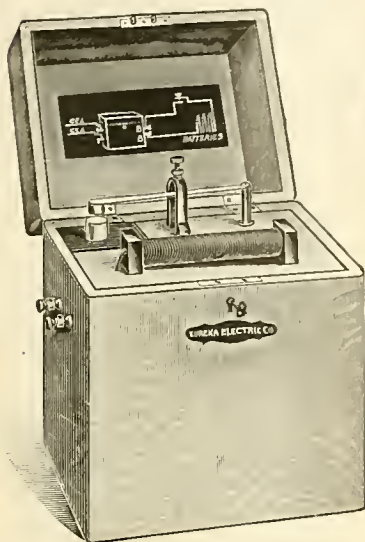
Most contractors have no doubt been confronted, where floor space is valuable, with the problem of a two-inch partition and a 2 1/2-inch receptacle. This obstacle is overcome by the "new style," it being less than 1 1/2 inches deep. Another inconvenience in the old style was the trouble in pushing slack wire back into the wall. This is also overcome in the "new style," which has face connections. There is no necessity of handling the face plate and per-

haps spoiling it while connecting it, as the plate can be removed, and, after wiring is all finished, it can be put on. This will enable one to present a more creditable job at completion. Notwithstanding these important improvements, there is no advance in price over the old style.

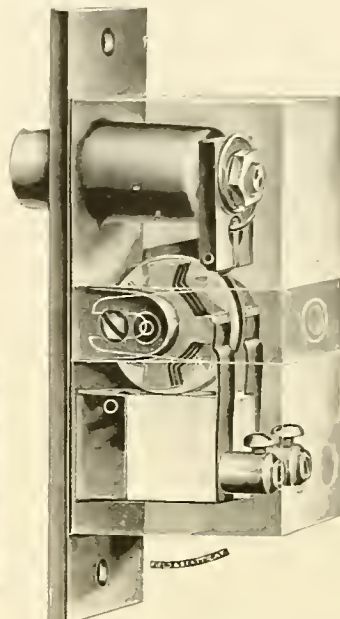
It should be noted, too, as important that the "new style" fits the regular Cutter switch-box. Fig. 1 represents the receptacle open and by itself and Fig. 2 shows it in position.

A Useful Novelty.

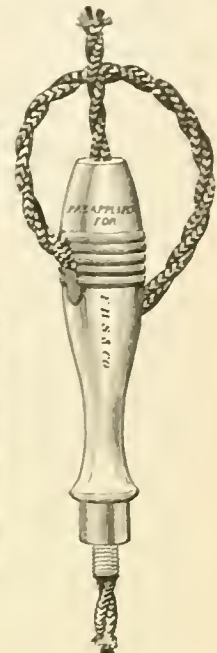
The accompanying cut illustrates the Stewart combination socket handle and adjuster for attachment to incandescent lamp sockets. As the manufacturer



EUREKA CENTRAL-ENERGY GENERATOR.



ECO ELECTRIC DOOR SWITCH.



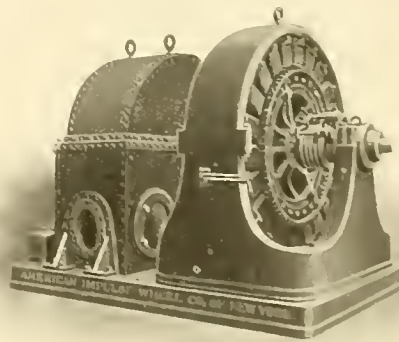
A USEFUL NOVELTY.

of this simple but useful and convenient device reports to date a sale of over 35,000, and all within a period of one month, it would appear as though a "winner" had been found.

This Stewart handle has metal ferrule, no unsightly ball and grips any size of cord. The adjustment is always handy, and it takes all strain from socket. An investigation of a sample is said to reveal its merits at once and to show it to be a "seller" for supply houses.

American Impulse Water-wheel.

The picture shows one of the impulse water-wheels of the American Impulse Water Wheel company of New York directly connected to a generator. This company is sending out a large number of wheels in this country and abroad for electrical transmission plants. Its wheels are of high efficiency and are spoken of in the most complimentary manner wherever used. The company also manufactures small water motors for operating fans, printing presses,



AMERICAN IMPULSE WATER WHEEL

organs, etc., and these motors are designed and built with the same care as the larger wheels. The company is equipped to execute orders promptly.

Western Electric Veterans Banqueted.

On Saturday evening, May 13th, at the Grand Pacific Hotel, a dinner was tendered by the office employes of the Western Electric company to their comrades returning from military service—Lieutenant William J. Unfried, Lieutenant A. Baade and Sergeant J. Furstenberg of Company L, Second Illinois Volunteers. Alderman J. C. Cannon, in an impressive speech, formally welcomed the "boys"

home and the only thing of note here was that the evening was when Sergeant Furstenberg responded for the volunteers, recalled the loss of Charles E. Donley in camp at Tappan, Pa., paying a glowing tribute to his dead comrade. The Western Electric company was well represented at the war, and "Charles" Donley was the only one who did not return. The men will return to their old positions with the company, ready when necessary, no doubt, to respond promptly again to their country's call.

After the dinner there was singing and speech-making. Max M. Wolfarth was the first to address following Mr. Cannon's address of welcome there

was a programme in which Rollo Kearsley, Messrs. Fuller and Wayman, George Chandler, Captain Philip Rust, Fred Uhrig, E. C. Mauermann, J. E. Phelps, William J. Powell, D. L. Harmon, Frank Swan and others took part.

Eco Electric Door Switch.

Edwards & Co. of New York have just put on the market the Eco door switch, herewith illustrated, the invention of Mr. A. Lungen. It is intended for telephone booths, toilet rooms, etc. The object attained is the lighting of an incandescent lamp by the opening of the door and the extinguishing of the light by closing the door. When the door is opened, contact is made and the lamp is lighted. The user of the booth closes the door after him and the light is still burning. By opening the door to come out the light is extinguished. On closing the door afterward there is still no light.

This contrivance has been approved by the Na-

tional Board of Fire Underwriters. It is provided with a porcelain cover and porcelain insulation. The size of mortise required for this switch is 2 1/4 inches long, one inch wide and 1 3/8 inches deep. The size of the front plate is 3 1/4 inches by one inch so that it can be used in any door frame. The carrying capacity for 110 volts is five amperes. This is the first electric-light article which Edwards & Co., who have been manufacturers of electrical house-keeping specialties since 1872, have ever offered.

Work has been begun on the electric railway from Ypsilanti to Saline, Mich. It will be completed within the next 60 days.

CORRESPONDENCE.

New York Notes.

New York, May 15.—Mr. Flower's death had the depressing effect on the "Flower stocks" that was to be expected. The market closed on Friday before his death. Brooklyn Rapid Transit then sold at 118½. On Saturday morning everybody knew that Mr. Flower was dead, and the opening sales of this stock, with which he was so closely identified, ranged from 100 to 110, some 25,000 shares being offered. Other Flower stocks suffered more severely, New York Air Brake showing, at one time, a loss of 60 points. During the morning Rapid Transit fluctuated a good deal, the decline being early checked by a rally, followed by renewed selling. The closing price was 106½, a net loss for the day of 11¼ points. The transactions in Brooklyn Rapid Transit amounted to nearly 200,000 shares. The firm of Flower & Co. had many offers of financial assistance, and it is not believed that its stocks will decline much farther. It is said that the street-railway amalgamation and extension in Brooklyn was Mr. Flower's pet enterprise. When Mr. Flower first became interested in the company three years ago it controlled approximately 200 miles of track and employed 4,000 men. Now nearly 600 miles of railroad is under the direction of the Rapid Transit company, and the list of employees contains over 12,000 names. The system has been correspondingly improved in plant and operation. The lines now controlled by the Rapid Transit company include all the surface trolley companies in Brooklyn, with the exception of the Coney Island and Brooklyn, and both of the elevated companies; that is, the Brooklyn "L" has actually passed into the possession of the stronger company and the Kings County "L" practically so, as it is now being reorganized along lines laid down by the managers of the Rapid Transit company with a view to a more complete consolidation.

Saturday evening's meeting of the New York Electrical society at Madison Square Garden was a Volta celebration and was attended by several representative Italians. Messages of congratulation upon the century of progress that has passed since Volta's discovery of the primary battery were sent to the Italian government, the Volta congress at Como and to the Italian Electrical association.

Another obstacle has been placed in the thorn-strewn path of the Board of Rapid Transit Commissioners. Mayor Van Wyck has vetoed the rapid-transit bill without giving reasons. The board now says that the rapid-transit railroad must be built by the city itself, or not at all. John Claflin has resigned as a member of the board in order that the commission might be free to elect Alexander E. Orr to fill the vacancy, Mr. Orr having ceased to be a member of the commission upon retiring from the presidency of the Chamber of Commerce.

The street-railway companies of the state are endeavoring to induce the governor to veto the Ford bill, taxing the franchise privileges of public-service companies. However, the governor seems to favor the measure and may sign it.

Early next spring the Third Avenue Railroad company will begin the work of converting the Drydock and East Broadway horse-car line into an underground trolley line. When that work is completed, says the Tribune, the company will have discarded every horse and cable car and will be electrically equipped throughout its whole system. Within a couple of weeks at most the Third Avenue main line will be ready for the trolley cars, and the Boulevard and One-hundred-and-twenty-fifth street lines will be in readiness by the end of July. The new electric cars, which have already been delivered, are nearly 10 feet longer than the cable cars. The outside coloring is the familiar vermilion hue which the company has adopted, while the interior decorations are mainly vermilion and cream. The sides are completely perpendicular, not being drawn in at the bottom as are the old cars. At either end are roomy platforms and easy steps. They are double-trucked, and each car will have four motors, each of 36 horse power. The difficulty experienced on the Sixth Avenue line last winter during the heavy snowfall was a factor, it is understood, in determining the Third Avenue company to give the cars enough power to push through any ordinary storm. The vehicles are constructed with an important improvement invented by J. H. Robertson, the company's superintendent. The cars are so made that they can be converted from a closed to an open car, and the company thus expects to avoid the expense of duplicating its rolling stock. The front and rear windows have drop instead of stationary sashes, permitting a free circulation of air when needed. The old-fashioned hand-trap is done away with, and the door has been fixed to open and close automatically, allowing a more convenient method of getting aboard. M. S.

PERSONAL.

deliberations during the ensuing year. Professor W. E. Ayrton has been chosen as honorary treasurer.

Richard McCulloch of St. Louis has been made general manager of the Compagnie des Tramways Suisse, at Geneva, Switzerland. All the horse tramways in Geneva are now owned by an English syndicate. Practically the entire system will be renewed, with additional mileage. It is to be all electric. Mr. McCulloch is to be master of construction, and when the lines are completed he will manage them and represent the syndicate.

Lord Kelvin was entertained at a banquet in his honor by the Associazione Elettrotecnica Italiana at the Grand Hotel, Rome, on Monday, May 1st. Speeches were made by Commandeur Cardarelli (on behalf of the Italian government) and by Professors Ascoli and Mengarini, to which Lord Kelvin responded. A telegram was read from the minister of posts and telegraphs, expressing his great regret at being unavoidably absent in consequence of parliamentary business.

"Speaking of General Funston," says the Kansas City Journal, "it is strange what currency has been given to the statement that his hair is red. The item first appeared in a New York paper, and probably the cause of it was the fact that Funston used to be about New York a great deal in company with Charles Gleed and E. W. Caldwell, the well-known electrician, formerly of the Kansas University. Mr. Caldwell's hair is red, and most likely some newspaper man who was introduced by Gleed to both Caldwell and Funston remembered Caldwell's hair and in due time attached it to Funston's head."

Plummer S. Page, a well-known street-railway man of Scranton, Pa., died suddenly on May 14th from the rupture of a blood-vessel in the head. When stricken he went across the street for a physician, and was explaining his symptoms to him when he suddenly sank to the floor and expired. Mr. Page was 58 years old, and was a native of Vermont. He built parts of the Lackawanna, Delaware and Hudson, Erie and Wyoming and New York elevated railroads, and owned large interests in the Long Island Traction and Cortland (N. Y.) Traction companies. In 1887 he bought the street-car lines in Scranton and substituted electricity for horses as the motive power, giving to the city its first trolley cars.

Roswell P. Flower, one of the prominent capitalists of the country and very actively interested in electric-lighting and street-railway properties in Brooklyn and Long Island, died on May 12th, quite suddenly, at Eastport, L. I. The immediate cause of death was heart weakness, superinduced by acute indigestion. Mr. Flower was ill for only a few hours. He was in his 64th year. His connection with electrical industries was of a financial character entirely. He is credited with the virtual consolidation of all surface and elevated street-railway lines in Brooklyn under the Brooklyn Rapid Transit company and a like combination of the electric-lighting interests of that borough under the Kings County Electric Light and Power company. He was reputed to be very wealthy.

The reception given by Mrs. Westinghouse in Washington on May 11th to the members of the American Society of Mechanical Engineers was an elaborate affair. The ballroom, built for the occasion, covered the entire garden at the rear of the Blaine mansion, in Dupont circle, and had a capacity equal to that of the cast room in the White House. Mrs. James G. Blaine was one of the receiving party, this being the first occasion of her presence in the house at an entertainment since her occupancy of it during the Arthur administration. The others who assisted Mrs. Westinghouse in receiving were the secretary of state and Mrs. Hay, Mrs. Harriet Blaine Beale, Mr. and Mrs. William Boardman, Mrs. Robert Hitt, Mr. and Mrs. Horace Wiley, Mr. and Mrs. Archibald Hopkins, Representative and Mrs. Dalzell and Mr. and Mrs. B. H. Warren of Pittsburg, Pa.

ELECTRIC LIGHTING.

According to a London dispatch dated May 15th, a syndicate, of which Dick, Kerr & Co., Limited, is the head, is erecting and equipping a big electric plant at Preston. It has given the contract to a Belgian firm, which undertakes to complete the work in six months. No English guarantee for the completion of the work in less than a year could be had. The contracts for the machine tools will be placed in the United States, where the principal superintendents of the works will be engaged.

A New Brunswick, N. J., dispatch of May 12th is as follows: "The purchase of the plant of the Edison Electric Illuminating company was consummated to-day. Hobart Tuttle, a Paterson lawyer, who is also private secretary to Governor Voorhees, recently secured an option in the interest of a syndicate, and to-day paid \$109 a share for every share delivered, 427 in all. The new holders of the electric light company will assume a bonded indebtedness of \$50,000, drawing six per cent. The company was incorporated March 14, 1885. Its officers are: President, Charles J. Carpenter; secretary, Peter S. Atkinson; treasurer, Theodore B. Booram. The officers, with John Waldron and

James Deshler, constitute the board of directors. The names of the men who form the syndicate were not revealed."

It has been definitely resolved to carry out the suggestions of the director of public lighting and close the municipal electric-light works of Buenos Ayres. The director, in his report, states that in 1898 the cost of the four power houses was \$63,500, while, at the rate charged by private companies for other public lighting, the work could have been done for \$35,000. He is of the opinion that by increasing the light to an all-night service the companies would do the work for about \$47,000, and concludes by recommending that the private companies be asked to tender for the service.

ELECTRIC RAILWAYS.

The contract for building a new electric railway at Parkersburg, Va., has been awarded to James F. Bradley of Manchester, Va.

President Agassiz of the Calumet and Hecla copper mine has granted a franchise to Edward Ryan and other copper-country capitalists to run an electric railway from Red Jacket to Larium.

A company of Chicago capitalists will build an electric road from Cassopolis via Dowagiac and Sister Lakes to Benton Harbor, Mich., where it will connect with the South Haven and Saugatuck line. Arrangements for making the survey are now in progress.

There is a movement on foot for the consolidation of the trolley lines operating in and about Paterson, N. J. It is said to be quite certain that the Central, which will be sold at receiver's sale, and the White line, which will be disposed of in like manner on June 10th, will be purchased by the combination.

W. J. Hart, general manager of the Detroit, Lake Shore and Mount Clemens electric railway, has handed in his resignation. Hereafter the Shore Line will be managed by T. N. Fordyce, as secretary and manager, Frank A. Draper, superintendent, and L. J. Ranney, superintendent of the mechanical department.

An electric railway is about to be constructed between Saint-Gervais-les-Bains and Chamonix, the well-known Swiss village at the foot of Mont Blanc. The line, which will be of one-meter gauge, will be used for carrying both passengers and goods. The water power of the River Arve is to be utilized to generate the necessary electrical energy, which will be supplied from four power plants.

The Westinghouse company has received an order to equip a trolley line between Philadelphia and Atlantic City. The company will be known as the West Jersey and Seashore Electric Railroad company, and it is expected that it will be in full operation before the summer rush begins. The promoters have not announced the fare, but say it will be much lower than the railroad rate.

The electric railways of Argentina are all supplied with equipments from the United States. During the last two months almost every vessel going to Buenos Ayres has taken \$50,000 worth of car material, a large part of which was received by the Belgrano Tramway company. The Capital company has also been a large buyer in the American market, its entire plant being of American construction.

An Albany dispatch says that the New York State Railroad Commission has received over 50 applications from inventors and manufacturers for participation in the tests to be made of air and other power brakes for street-cars in New York city. The Metropolitan Street Railway company has placed its cars and lines at the disposal of the commission for the test, which will be held with a view to introducing power brakes on surface roads in the state.

It is now stated that Tom L. Johnson, the street-railway magnate, has conceded one of the main points of difference that have been blocking negotiations for the purchase of the Detroit roads by the city. The city's commissioners refused to execute any security franchise to insure payment of the purchase price unless that instrument provide for present rates of fare on three-cent as well as five-cent lines. This concession has now been made. The most important question remaining at issue is whether the proposed 30-year security franchise shall run from the date of sale or from the expiration of present franchises, averaging about 16 years hence.

ELECTRIC VEHICLES.

The first automobile to be operated in the streets of Washington arrived there May 10th from Hartford, Conn., and was used by O. T. Crosby, who had as his guest on the initial ride the French ambassador. The vehicle is a four-seated affair, with the seats arranged back to back, and geared to a speed of 12 miles an hour. The automobile is of the Columbia type. Other automobiles of several types, including two, four and 16-seat coaches, will be put into operation in Washington as soon as they are delivered. The smaller vehicles will be for private use and for hiring purposes, and the larger

ones will be used as public conveyances, following Sixteenth street, Pennsylvania avenue and other principal thoroughfares.

INDUSTRIAL COMBINATIONS.

There is talk in Philadelphia of a consolidation of the lighting and transportation companies of that city. The capitalization, it was said, will be \$150,000,000. The following corporations are said to be in the new organization: Union Traction company, \$30,000,000; National Electric company, \$25,000,000; Electric company of America, \$25,000,000; Pennsylvania Manufacturing company, \$15,000,000; Pennsylvania Electric Vehicle company, \$10,000,000. The proposed consolidation is said to be the outcome of the recent demoralization of the stocks of the lighting and transportation companies when the advent of the National company was announced.

ELECTRICAL SECURITIES.

Announcement is made that \$250,000 first-mortgage five per cent. 30-year gold refunding bonds of the Hudson River Gas and Electric company of Tarrytown, N. Y., have been issued. Interest is payable May 1st and November 1st in New York. The bonds are secured by a first mortgage on the property of the Hudson River Gas and Electric company, supplying gas and electricity in Tarrytown, North Tarrytown, Irvington, town of Greenburg, Dobbs Ferry, Ardsley, Hastings and Pocantico Hills. The total permanent population is about 16,000, with substantial increases in the summer season. The company operates about 25 miles of gas mains and 50 miles of electric pole lines, and does all the public and domestic lighting of the towns mentioned. The net earnings of the company have been in excess of \$20,000 for each of the last three years, as against interest requirements on this issue of \$12,500.

PUBLICATIONS.

The type K transformer of the Pittsburg (Pa.) Transformer company is described in a pamphlet just out and known as "Catalogue B." The apparatus is clearly and carefully described, with good illustrations. A perusal of the 16 pages that constitute the body of the publication will give any alternating-current user a good idea of what the Pittsburg Transformer company denominates "a thoroughly well-made and efficient transformer."

Bulletin No. 8 of the Crocker-Wheeler company of New York was written by Dr. S. S. Wheeler, the president of the company, and is very interesting. It treats of motors with special characteristics for mills or factories and for elevators, and also of the new brake motor brought out by the Crocker-Wheeler company. Under the head of mill motors is also described the company's car motor and under the head of elevator motors its shop motor, they being modifications of the types under which they are described. Reference is made to controllers of the sizes used with mill motors directly after the description of mill motors. The investigation which the engineers of the company have made of the "heating-time average," on page 8, seems to be a careful analysis of the heating of a machine in intermittent use for four hours. The cut which accompanies the description shows curves of continuous and intermittent heating and the resulting rate of temperature rise. The machines advertised in this bulletin are especially designed for exceptional operating characteristics, protective forms and controlling mechanism, which fit them particularly for all work requiring great momentary turning power, safety from external injury or convenient automatic starting and stopping. The development of these types for particular kinds of work, following the universal acceptance of electric power, is a natural case of evolution, by which in time special types spring up for special purposes. The arrangements and illustrations of the bulletin are excellent and reflect credit on the publication bureau of the Crocker-Wheeler company.

MISCELLANEOUS.

The North Chicago Street Railroad company is experimenting with a compressed-air car for night service.

It is said that no subscriber to the Amalgamated Copper company's stock will be allotted over 20 per cent. of the amount of his subscription. Formal notice of allotment calls for payment on May 22d.

It is said that a boy of 19, the son of a Portland (England) grocer, has invented a noiseless, smokeless electrical gun, for which he has refused £75,000 offered by the British Admiralty. The new weapon, it is claimed, discharges explosives at a range of 5 1/2 miles with great accuracy.

It is announced that the annual banquet of the Chicago Electrical association will be held at the Technical Club on the evening of May 10th. Mr. E. W. Jewell, president of the McIntosh Battery and Optical company, will act as toastmaster. Mr. J. M. Hollister is chairman of the banquet committee. This is the 110th meeting of the association.

Michael Jost, a laborer, was struck by lightning at Wrightwood and Hermitage avenues, Chicago, while returning home from work on May 10th

and instantly killed. Within a few feet of Jost when he met his death were Policemen Preuss and Queen. They were thrown to the ground by the shock, and when they regained their senses found Jost lying dead.

TRADE NEWS.

The Electric Storage Battery company of Philadelphia has increased its capital stock \$4,500,000, making its total capitalization \$18,000,000.

The Leschen-Macomber-Whyte company of Chicago is distributing a very useful souvenir in the form of a paper-cutter. The cutter is neatly gotten up and is substantial.

The Swett & Lewis company, formerly of 11 Bromfield street, Boston, announces its removal to 79 Franklin street in the same city. The company claims to manufacture or sell everything connected with electro-therapeutic or X ray work.

The Western Electric company reports the supply business for the first four months of the year 1899 in excess of the corresponding period of 1898. This company carries in stock what is said to be the largest and most complete line of general supplies in the country.

The Board of Trade, Chicago, is equipping its offices with an independent private-plant telephone system, putting in a 200-wire Stromberg-Carlson central-energy switchboard and instruments. This will be, without doubt, the largest independent private plant in the West.

Two notices of removal come from the Buckeye Electric company of Cleveland. One refers to the main offices in that city, which are now in rooms 58-64 Wade building. The other states that the Chicago address is now room 1537 Monadnock building, where a unique exhibit of cellulose filaments is made.

The Graham Equipment company of Boston writes: "We have an order for 135 auto-trucks from the National Transportation company of Boston, to be used under the busses of the various lines that that company is establishing in the suburbs of this city. The trucks will be built with steel frames and will be equipped with Graham's spring suspension and equalized brakes. The National Transportation company frankly admits that our spring suspension is the only one that will enable it to do away with rubber tires and yet allow it to run over the pavements of the city at a high rate of speed without jar and inconvenience to the passengers or damage to the motive-power mechanism."

The co-partnership is announced of Mr. Charles Wirt and Mr. Irving B. Smith, both of Philadelphia, under the firm name of Charles Wirt & Co. Mr. Wirt has been well known for some years in the electrical fraternity, having quite early in the history of the industry come into prominence as an electrical inventor. Mr. Smith has been connected for about seven years with Queen & Co., and as head of their electrical department and as their electrical engineer he has gained some reputation as a designer and constructor of commercial and scientific instruments. The new firm has enlarged the manufacturing plant at 1028 Filbert street, Philadelphia, and is now prepared to fill all orders for rheostats, dimmers and brushes with promptness and satisfaction.

William Roche, manufacturer and inventor of new standard dry batteries, has removed from 259 Greenwich street, to more commodious and better located quarters at 42 Vesey street, New York, where he will be pleased to meet his old friends. There will be no more complaints on account of stairways, as Mr. Roche has now an excellent electric-elevator service. The office is on the top floor. From the windows an excellent view of old St. Paul's, the new St. Paul building, Syndicate building, busy Broadway and the Hudson River are to be had. Mr. Roche says that with the facilities of his new place and the already established reputation of his goods he hopes to be able to keep up with all demands. He feels that, having held his own against such competition as he has had in the past, he has good occasion for hope for the future.

The friends and patrons of the Central Electric company will be pleased to learn that it has accepted the western agency of the high-grade apparatus manufactured by the Bullock Electric Manufacturing company of Cincinnati. This company manufactures generators for power and lighting purposes, both belted and direct-connected, and makes a specialty of the highest grade of motors of all sizes for special purposes and for direct-connection to machinery of all kinds. Its "teaser" system of control for the operation of large newspaper and magazine printing-presses has received the highest praise, both in this country and abroad, and is claimed to be recognized as the most perfect known method of handling this class of work. The Central Electric company has a well-organized department to take care of this branch of its business, and anyone contemplating the building of a power plant, or the installation of motors for any purpose, is invited to take the opportunity of conferring with it before placing the order.

Gates & Randolph, the new Chicago firm for the sale of electrical apparatus, have just removed their office from the Marquette building to 13 and 15

Monadnock block, the old quarters of Street & Lundy, the electrical engineers, who will be better found on the eleventh floor of the Marquette building. One interesting and unusual feature of Gates & Randolph's new show room will be a model central station in operation and in full view through the windows from the main ground-floor corner of the building. A Triumph motor of 25 horse power will drive a Warren alternator, which through transformers, will supply current for four Sterling inclosed arc lamps and 20 or 30 incandescent lights. The plant will be completely equipped with a switchboard, Empire instrument and La Rue circuit breakers and switches. The idea is an ingenious one, and the model station will doubtless attract much attention. Mr. Randolph arrived in Chicago early in the work from New York and is now at work in the new firm's interest with the old cheerful hustle so familiar to the electrical men of Chicago.

BUSINESS.

Owing to the continued high price of copper, the Phosphor-bronze Smelting company, 209 Washington avenue, Philadelphia, has withdrawn all previous quotations on its metal, under date of May 10th, issuing a revised price list instead.

The Stromberg-Carlson Telephone Manufacturing company is reporting a large demand for its central-energy system. Among the orders recently received for complete central-energy equipment are from the exchanges at Brookings, S. D., Elizabeth, Pa., Northwood, Ia., and Nashville, Ill.

The raw-silk wipers manufactured by the American Silk Manufacturing company, 311 Walnut street, Philadelphia, are recommended and endorsed by the boards of fire underwriters of St. Louis and Philadelphia. These silk wipers are used in many electric-light stations, and are said to give better satisfaction than cotton-waste. One advantage of the raw silk is that there is little or no danger of spontaneous combustion.

The United States Express company has ordered for its building, 87 to 89 East Washington street, Chicago, a 30-kilowatt Western Electric direct-connected generator. The plant will be used for running 400 16 candle power incandescent lamps. It is also of interest to note that the Great Northern Hotel of Chicago is installing 10 Western Electric motors to operate the ventilating apparatus, laundry machinery, dish-washing apparatus, machine shop, and to drive the organ.

W. C. Hubbard, general manager of the Electric Arc Light company of New York, reports that his company is very busy at present and has just closed some good orders with such concerns as W. and J. Sloane, the Ogden Goelet estate, Central Railroad of New Jersey, New York; Palais Royal, Washington, D. C.; Campbell & Smith, Herren Bros. and John Daubs & Sons, Pittsburg. The address of the Electric Arc Light company is now, it should be remembered, 11 Broadway, New York.

The Ball Engine company of Erie, Pa., has in hand a number of foreign orders for engines. Russia, Japan, Mexico and Venezuela are the foreign countries now represented on the company's books. Among domestic sales of recent date of engines for electrical service, the following are reported by this company. Oliver Hotel, South Bend, Ind. 200 horse power; Edward Ford Plate Glass Works, Toledo, O., 175 horse power; American Chemical and Spirits company, Evansville, Ind.; West End Trust company, Philadelphia.

Since April 1st the sales of the Garton lighting arresters, manufactured by the Garton-Daniels Electric company of Keokuk, Iowa, have been over double what they have been in the corresponding period of any previous year. The Garton-Daniels company, in order to keep up its stock, has recently doubled its force of employees, and states that it will be able to meet any requirements for prompt shipments. The new kicking-coils and lightning arresters for the protection of small motors, fans, etc., are said to be meeting with a large demand.

The growth of the independent telephone-exchange business has created a large demand for the fine sizes of silk magnet wire used in telephone apparatus. The Electric Appliance company, realizing the importance of this demand, has recently made arrangements with the owners of a large factory devoted exclusively to the manufacture of fine sizes of silk magnet wire to handle their entire output. This places the Appliance company in a position to sell "on the ground floor" to large manufacturers of telephone apparatus, and it has already closed some handsome contracts.

The Ward Leonard Electric company announces a reduction in the price of its Carpenter field rheostats and theater dimmers. This reduction is as much as 30 per cent. in most instances. This cut in price is in strict conformity with the practice of this company of making reductions in price as soon as it is enabled to do so and still maintain a reasonable profit. Although the Ward Leonard company claims to have a practical monopoly in the line of field rheostats and theater dimmers, it has made such radical improvements in the cost of manufacture, due to new design and production in large quantity, that it feels that it can work

large reduction in price and still make a fair manufacturing profit. The field rheostats and theater dimmers of the Ward Leonard company are said to be the standard in those lines throughout the world, and foreign orders, already very large, will no doubt increase rapidly on account of the low price and high standard of quality.

Manufacturers of electric automobiles are invited to correspond with the Mica Insulator company, of 218 Water street, New York, and 117-119 Lake street, Chicago, in reference to Micanite insulation. This concern is especially equipped for the manufacture of commutator rings and segments for motors of this class of work. The Empire and M. I. C. Compound cloths and papers are used extensively by manufacturers of motors for electric vehicles. The company offers to send to any company a set of rings and segments for trial, free,

together with samples of its Micanite and Empire insulating cloth and paper.

The engineering and construction departments of the Chicago Edison company report a good business in wiring and isolated-plant work. Among the jobs now in progress and recently awarded them are isolated plants specified as follows: Oliver Hotel, South Bend, Ind., wiring for 1,800 16 candle power lights in iron-armored conduits, also a complete annunciator and telephone system, marble switchboard, instruments and connections for two 40-kilowatt and one 60-kilowatt General Electric dynamos, direct-connected to Ball engines; Massachusetts building, Baltimore, Md., the latest and perhaps the most modern in style of the fireproof office buildings in Baltimore, one 60-kilowatt General Electric dynamo, direct-connected to a Harrisburg Ideal engines, also wiring for about 1,000 16

candle power lights in iron-armored conduit; Grand Central Depot, Harrison street and Fifth avenue, Chicago, two 75-kilowatt General Electric dynamos, direct-connected to a 250 horse power Ames engine, also one 45-kilowatt belted General Electric dynamo, and a large new marble switchboard, about 21 by six feet, with connections for a complete plant of eight dynamos; Boys' Training School at Glenwood, Ill., wiring for 14 arc lamps and 500 incandescents, distributed among the various buildings, the wiring to be connected to one 45-kilowatt General Electric dynamo driven by an 85 horse power Ideal engine; State Normal School, De Kalb, Ill., one 40-kilowatt direct-connected engine and dynamo unit, marble switchboard and instruments and the wiring for about 1,100 incandescent lamps; Evening Star building, Washington, D. C., and also the electrical work for the new Hearst School, which is also located in Washington.

ILLUSTRATED ELECTRICAL PATENT RECORD.

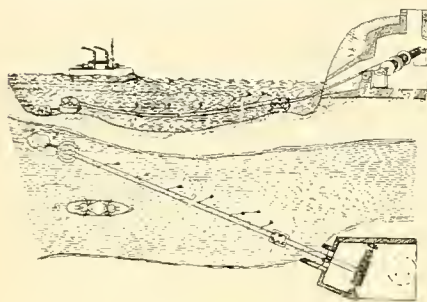
Issued May 9, 1899.

624,463. Incandescent Lamp. Elmer F. Dwyer, Lynn, Mass. Application filed March 9, 1899.

An incandescent lamp having a stem and a coiled or looped filament, the coil or loop of the filament being extended backward toward the stem and attached or secured directly and rigidly thereto by cement.

624,472. Submerged Torpedo Tramway. Christopher T. Finlayson, Denver, Colo. Application filed June 28, 1898.

An endless cable is arranged and adapted to be moved to and fro across the harbor from a suitable station and means are provided for supporting the cable at its terminal end and at desired points intermediate of its terminal end and the station. Means for attaching torpedoes to the cable and for releasing any one or more torpedoes from the cable and for electrically igniting them at the will of an operator are also provided.



NO 624,472.

624,487. Printing Telegraph. Kirk Himrod, Chicago, Ill. Application filed March 25, 1898.

A keyboard transmitter has two or more sets of pole-changers acted on successively by the keys and means for bringing the sets of pole-changers into connection with the main line subsequent to the operation thereof by the keys.

624,513. Battery Electrode. Herbert S. Lloyd, Philadelphia, Pa. Application filed May 19, 1897.

The electrode mold has clamping chill ridges provided upon the oppositely disposed sets on registering with each other for supporting and binding the electrode strips and strips of non-inflammable compressible material provided within the line of the chill ridges to contact therewith to prevent leakage of the hot metal into the interior of the body of the mold.

624,516. Apparatus Employed in Wireless Telegraphy. Guglielmo Marconi, London, England. Application filed January 5, 1899.

The combination of a transmitter, a receiver, an aerial conductor, a metallic box containing the receiver, earth connections to one terminal of the transmitter and to the box, an interchangeable connection from the aerial conductor either to the other terminal of the transmitter or to one terminal of the receiver, a connection between the other terminal of the receiver and the box, a relay operated by the receiver, a telegraph instrument outside the box, a connection between the box and one terminal of the relay, a connection between the box and one terminal of the telegraph instrument, a connection insulated from the box between the other terminals of the relay and telegraph instrument, a coil of insulated wire outside the box in the latter connection and a metallic covering to the insulation in connection with the box.

624,531. Electrically Operated Rudder-controlling Mechanism. Richard B. Panton, Williamsport, Pa. Application filed September 13, 1897.

In an electrical rudder-controlling mechanism a reversible electric motor having operative connection with the rudder shaft is employed, a swinging brake-arm frictionally engaging with the shaft and gearing for retarding the motion of the brake-arm.

624,542. Telephone Register. Herbert T. Richards, New York, N. Y. Application filed March 6, 1899.

A system is employed comprising a registering circuit including a source of current connecting two stations, a current controller at one station, a register controlled by the junction of the operator at the two stations, a movable device obstructing the removal of the telephone receiver at the other station and a circuit closed or actuated by the movable device to close the registering circuit at the latter station.

624,552. Carbons for Electric Lamp. O. Sponinger, Vienna, Austria. Application filed February 15, 1899.

The composition described for carbons for electric arc lamps consists of ground carbon, 200 parts of quartz diamond dust, an amount of 20 to 50 parts of copper salt and 100 parts of water.

624,574. Edison Battery. James Sullivan, New York, N. Y. Application filed January 27, 1899.

A zinc-iron battery cell is composed of a porous zinc electrode and a porous iron electrode, the latter being exposed to the air.

externally to the air and rendered sufficiently dense to prevent the passage of an electrolytic fluid onto its exterior surface and so constructed that the cell may be charged, recharged and discharged through suitable pipes arranged as follows: On the exterior surface of the carbon vessel a glass or rubber discharge tube is partially suok into and cemented to the carbon extending from the top to the bottom of the vessel, and opening inwardly at the top into a slot cut half an inch deep in the top of the carbon vessel; a glass tube is sunk and fastened into the inner wall of the carbon vessel, extending from the top to near the bottom, as a means of charging the cell with acid from the bottom upward, or recharging it and thus forcing up the spent fluid to the discharge pipe; together with the whole forming a primary battery composed of the following elements: A cylinder of amalgamated zinc immersed in a solution of chloride of sodium contained in an earthen porous cup, the porous cup partially immersed in commercial nitric acid contained within the carbon-containing vessel and resting upon the bottom of that vessel.

624,615. Time Cut-out for Electric Lamps. James H. Boardman, Port Huron, Mich. Application filed July 14, 1898.

The combination is claimed with the clock circuit, the break wheel and the contact spring and the electromagnet, of the armature, the main-line circuit and the main-line switch having its free end traveling in the path of the armature, and the leaf springs operatively connected to the switch.

624,652. Alternating-current Motor. Alexander Heyland, Frankfurt-on-the-Main, Germany. Application filed February 18, 1898.

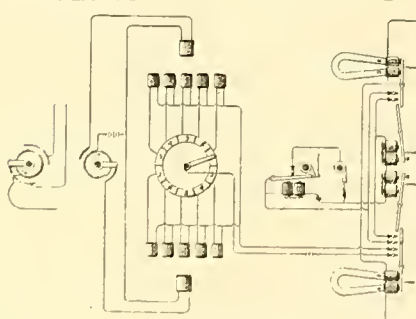
The method of starting and running an alternating-current motor having sets of inducing windings consists in supplying current first to those portions only of one set of the inducing windings in closest inductive relation to the other inducing windings, and thereafter supplying current to the other portion or portions of the set of inducing windings.

624,666. Telephone System. Frank A. Lundquist, Chicago, Ill. Application filed September 20, 1897.

A pointer and a series of insulated contact points, a clock mechanism consisting of a motor spring and an escapement, a disk rotated by the clock mechanism and provided with pins adapted to engage the pointer so as to move it step by step over the contact points, a second magnet provided with connections adapted to raise the pointer so as to release it from the pins on the disk, a spring for returning the pointer to a normal position when so re-leased, and a second spring for returning the pointer to engagement with the pins.

624,696. Telephone Transmitter. James H. Spencer, New York, N. Y. Application filed November 30, 1898.

A telephone transmitter is described having a diaphragm composed of two thin disks, and layers of tissue between the disks, the disks and layers being secured together only at the center.



NO. 624,487.

624,697. Telephone Transmitter. James H. Spencer, New York, N. Y. Application filed March 31, 1898.

In this transmitter there is a frame having an annular seat, a disk or diaphragm lightly dished on both faces and resting on the seat, the disk or diaphragm being of considerable thickness so as to be but slightly flexible, clamps secured to the frame and curved to bear at two points, only on the disk or diaphragm, and buttons, one of which is carried by the disk or diaphragm and the other is supported from the frame.

624,703. Electric Arc Lamp. Christian Tepel, Bennington, Pa. Application filed April 26, 1898.

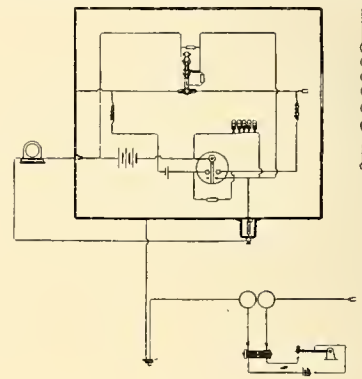
A lever is suitably fulcrumed and a second lever fulcrumed thereto; a carbon holder is carried by the first-named lever with a clutch on the second lever and means for causing the carbon holder to move faster than the clutch.

624,744. Storage or Secondary Battery. Henry Blumenberg, Jr., New York, N. Y. Application filed August 18, 1898.

In a battery containing two elements of different polarity there is an electrolytic solution containing tersulphate of aluminum and bisulphate of an alkali or alkaline earth, such as potassium, sodium or ammonium.

624,813. Means for Regulating Speed of Electric Motors. Otto C. Immisch, London, England. Application filed March 7, 1898.

A main battery drives the motor, and an auxiliary battery and means for switching the current of the auxiliary battery in opposition to the main current for producing a lower rate of speed are also provided.



NO. 624,516.

624,815. Commutator Brush-holder. Gustave H. Jantz, Wyoming, William Leist, Norwood, and Otto W. Jantz, Cincinnati, Ohio. Application filed February 11, 1899.

In a brush-holder there is the combination of a frame having parallel flat projecting guideways, a brush mounted on the guideways, means carried by the brush and engaging the guideways to hold the brush in place thereon and means to hold the brush in yielding engagement with the commutator.

624,824. Adjustable Vibrator for Magnetic Coils. Charles A. Keller, Cleveland, Ohio. Application filed December 5, 1898.

A vibrator for interrupting an electrical current consists of a vibrator spring, a swiveled post to which the spring is secured and means for preventing the post from turning.

624,838. Annunciator for Telephone Switchboards. William O. Meissner, Chicago, Ill. Application filed November 17, 1898.

The essential features are thus enumerated: A front plate or support, carrying a pivoted shutter, a pair of supporting arms extending rearwardly from and attached to the front plate, a metal cylinder mounted on the arms, a detachable cover closing its rear end, an electromagnet in the cylinder, an armature between the cylinder and the front plate, the armature being pivoted at its lower extremity between the supporting arms; a latch arm extending forwardly from the upper extremity of the armature through the front plate to engage the shutter, and an insulating block lying between the supporting arms and carrying contact springs to co-operate with the shutter.

624,881. Telephone System. Daniel M. Therrell, Atlanta, Ga. Application filed April 5, 1897.

A compound transmitter comprises a diaphragm, a variable resistance in operative relation to the diaphragm, a local circuit including this variable resistance, a source of energy in the local circuit, an induction coil, the primary of which is connected into the local circuit, the secondary whereof is divided into two branches of equal resistance, variable resistance-repeating transmitters in each branch of the divided secondary circuit, local battery circuits controlled by the variable resistance-repeating transmitters, induction coils having their primaries in the local battery circuits and their secondaries connected into the main-line circuit in multiple.

624,895. Automatic Magnetic Circuit-breaker. William M. Scott, Philadelphia, Pa. Application filed July 28, 1897.

The combination is claimed of automatic magnetic means for breaking the circuit upon the occurrence of a predetermined abnormal flow, normally open-circuited automatic magnetic means for breaking the circuit upon the occurrence of a less abnormal flow and automatic magnetic means for bringing into circuit the normally open-circuited means upon the continuance of the less abnormal flow during a given space of time.

Western Electrician

EVERY SATURDAY.

Vol. XXIV.

CHICAGO, MAY 27, 1899.

No. 21

Gen. S. T. Carnes, President of the National Electric Light Association.

This year, for the first time in its history, the National Electric Light association went to a distinctively southern city for its president. Baltimore and St. Louis have furnished presidents in former years, but neither can be said to be so thoroughly in the South and of the South as Memphis, the home of the gentleman now honored with the presidency—General Samuel T. Carnes, the president and manager of the Memphis Light and Power company. General Carnes is a southern gentleman in the best and truest use of that expression. His acquaintance among the leading electrical men of the country is extended, and his friendship is highly prized as that of a man whose motives are lofty and whose impulses are honorable. General Carnes is earnest and cordial in his likes and dislikes. He is a man warmly cherished by his friends, to whom he is devoted; and as an enemy he is not to be despised.

The following brief sketch of the career of the new president was prepared for a recent issue of the Memphis Scimitar: "Perhaps no man in all the city of Memphis is better, more widely or more favorably known than General Sam T. Carnes. The father of General Carnes was one of the pioneers of Tennessee, and the son is worthy of the sire. Barring a brief period of infancy, General Carnes has spent his life in Memphis. He was born in Hardeman County, West Tennessee, in 1850. He was by birth and inclination a military genius, and his early training and tendency have gone far toward making him one of the best-known military tacticians in the country. For a long time he was brigadier-general of this state, thus having charge and control of all the militia of the state. This military talent was both inherited and cultivated. His father before him was quite a military enthusiast and expert, and was at one time at the head of the state national guard. General Carnes was elected captain of the Chickasaw Guards of this city in 1878. This was at the time decidedly the best military company in the state, and one of the best in the nation. Engaging in many contests, it lost but few, and became, under his captaincy, one of the most celebrated companies in the land. To General Carnes is due the first introduction of both the telephone and electric light to this city, and he has been for years the president and general manager of the Memphis Light and Power company. General Carnes was married in 1881 to Miss Kate Kerr of this city and has two daughters, aged 14 and 16."

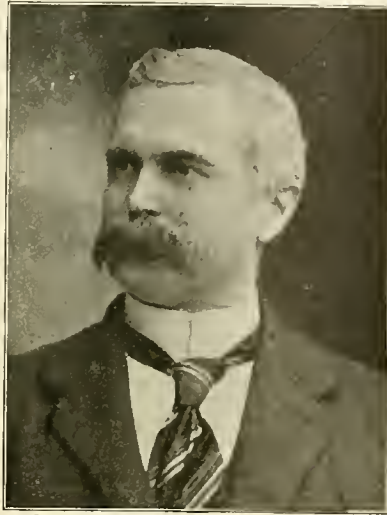
General Carnes is well known in Chicago, where he is a frequent and welcome visitor.

Convention Entertainments.

Mr. Frank L. Perry of Chicago gave his lecture, entitled "Curious Things Electrical," in the lecture room at Madison Square Garden on Tuesday even-

ing of convention week. Mr. Perry was introduced by Mr. C. O. Baker, Jr., president of the Electrical Exhibition company, and held the attention of those present for about an hour. One feature of the entertainment of novel interest was Mr. Perry's "elec-

trical head"—a cleverly constructed automaton that performs several surprising feats by electro-mechanical means. The "automobile parade" took place on Thursday afternoon and was a great success. Nearly 50 electric carriages, carrying ladies and gentlemen interested in the exhibition or convention, were in line. The party started from Madison Square Garden



GEN. S. T. CARNES

at about 3:30 p. m., and the parade ended at Columbia University a little more than an hour later. The route of the parade was Madison avenue to Twenty-sixth street, to Fifth avenue, to One-hundred-and-eleventh street to Lenox avenue, to One-hundred-and-tenth street, to Morningside avenue, to One-hundred-and-nineteenth street, to One-hundred-and-seventeenth street, to Amsterdam avenue, to Columbia University, where the parade was dismissed. It is said that more different styles of electric carriages were in line than were ever seen anywhere before. A photograph of the carriages is reproduced on page 296. J. M. Hill and J. W. Godfrey were marshals of the parade. At One-hundred-and-nineteenth street and Morningside avenue the parade halted, and most of those in the carriages got out and visited Grant's tomb. At Columbia University they were entertained at tea by Professor G. F. Sever of the department of electrical engineering, after which they visited the university buildings. Those who returned to Madison Square Garden sat down to an "automobile supper" in the garden restaurant.

son's fleet, and from there up the Hudson as far as Grant's tomb. Luncheon was served on board. Among those in the party were Mr. and Mrs. Manson and Mrs. Mansn of Okonite Inc., Mr. Rodman, Mr. and Mrs. John S. Sulloway, Mrs. Henry Cutter, Mrs. Tappler, Mr. and Mrs. Fleming, Mrs. Foote, Mrs. W. W. Low, Mr. Frank L. Perry, Mr. and Mrs. Mosher, Mr. and Mrs. Godfrey, Mr. McKay, Mr. Olsen, Mrs. Scovil, Mr. and Mrs. H. Kins, Mr. Shippy, Mr. Hillman, Mr. Price, Mr. Barron and Mr. Collins. The weather was perfect and the trip was a great success. On returning to the dock the party was met by automobile and conveyed to the Murray Hill Hotel.

Manager Mullen of the advertising department of the General Electric company had organized the trip to Schenectady for the convention delegates, which took place on Friday, and enabled the visitors to spend the entire day in Schenectady, visiting the works of the General Electric company. Mr. Mullen has had charge of the advertising department of the General Electric company for only a comparatively short time, but he has already made a host of friends among the newspaper men, and evidences are already seen of his marked ability. Handling the advertising of so large an institution as the General Electric company is no small undertaking, and the manner in which Mr. Mullen has grasped the many details connected with the intricacies of this department would indicate that a wise choice had been made in his selection for this work.

Attendance at Meetings.

As usual, the greater part of the convention attendants, as well as a majority of electrical visitors at the exhibition, was composed of supply men and manufacturers, yet there was a large number of central-station men on hand. The accompanying group shows the delegates in attendance. There was always a fair attendance at the meetings, and the papers presented were thoroughly discussed. The range of subjects was wide and the interest manifested showed that they had been selected with great care. President Young was personally congratulated by many of the central-station men, as well as the manufacturers, upon the successful convention organized by him and his associates.

The Chicago Delegation.

The ladies and gentlemen in the Chicago party were W. W. Low, Electric Appliance company (with Mrs. Low); E. K. Patton, Perkins Electric Switch Manufacturing company (with Mrs. Patton); M. E. Baird, Eddy Electric Manufacturing company; H. A. Wagner, Missouri Electric Light company, St. Louis; James Wolf, New York Insulated Wire company; George S. Whyte, Leschen-Macomber-Whyte company; Edward Phillips, Detroit Illumi-



DELEGATES TO THE NATIONAL ELECTRIC LIGHT ASSOCIATION CONVENTION, NEW YORK, MAY 23-25, 1899.

ating company; H. Arnold, Illinois Electric Lincoln Park; C. E. Kamteyer, Electrical Engineering; Mr. Runn, Chicago Electric company; Franklin Overbaugh, Chicago General Fixture company; W. F. Collins, Western Electric and

On Thursday a delightful excursion on the steamer Isabel was tendered the ladies. The boat left Thirty-first street at about noon, ran up the East River to Hell Gate and Long Island Sound, then back to Staten Island, visiting Admiral Samp-

NATIONAL ELECTRIC LIGHT ASSOCIATION.

The meeting of the National Electric Light association at New York was, of course, the event of the week in electrical circles. It was the twenty-second convention of the organization, and the first under the rule adopted at Chicago last year, providing for the holding of the meetings alternately in New York and Chicago.

The attendance was remarkably large, many members taking advantage of the convention to visit the exposition at Madison Square Garden, which is being held in conjunction with the convention.

The formal meetings of the association were held in Convention Hall, Madison Square Garden, May 23d, 24th and 25th.

TUESDAY MORNING'S SESSION.

President A. M. Young called the opening meeting to order at 11 o'clock on May 23d, and read the following address:

PRESIDENT YOUNG'S ADDRESS.

"In opening the twenty-second annual convention of your association, I take great pleasure in welcoming you to the city of New York. I shall not attempt to enlarge on the beauties, advantages and wonders of this great city, because you all know

the association, held in New York, in August, 1885, the question of large and small engines and dynamos was discussed, and the late R. T. McDonald of Fort Wayne gave his experience at Peru, Ind., where they were operating a large plant, something like 165 arc lights, with two large engines and two large boilers. After running them a short time, it was found no money could be made operating in this way. Small engines were substituted, after which the company earned good dividends. In some of the large cities at the present time 6,000 horse power engine-dynamo units are being erected, and in most of the electric stations throughout the country large engines and direct-connected dynamos are the order of the day, and only by their use can the best economies be obtained.

"The successful development of high-tension service is making it possible to utilize the water powers that have been so long undeveloped. This service is revolutionizing the power question as to manufacturing business in many of our prominent manufacturing towns, where formerly steam had been altogether employed. As we are all very much interested in the question of high-tension service, I think we shall learn much that will be helpful to us from the papers to be read on this subject and from the illustrated lecture which will be given at this session.

"It has been the aim of your president to secure

for the ladies would take place on Wednesday afternoon, and a sail around the harbor, for the ladies, on Thursday morning. The meeting then adjourned.

TUESDAY AFTERNOON'S SESSION.

The president called the meeting to order at 2:15 o'clock and announced that the first paper for the afternoon's session would be on "Rotary Transformers and Storage Batteries, as Related to Long-distance Transmission," by William Lisenard Robb of Hartford, Conn. Mr. Robb then read the paper, and the discussion was opened by Mr. Leslie of New York, and Mr. Ayer of Boston, Mr. Ferguson of Chicago, Mr. Edgar of Boston, Mr. Wagner of St. Louis and Mr. Doherty of Madison participated.

The president announced the next topic as "Transformer Tests," and introduced Professor W. E. Goldsborough of Purdue University, who read a paper on the subject, which was accompanied by a number of charts. Mr. Leslie of New York opened the discussion with an elaborate review of the work of the Manhattan Electric Light company of New York since 1893. Professor Robb of Hartford made some inquiries, which opened up a new line of discussion by Professor Goldsborough. It was taken up by the president, Mr. Leslie, Mr. Rice, Mr. Wagner, Mr. Ayer, Mr. Corey, Mr. Perkins and Mr. Seely.

WEDNESDAY MORNING'S SESSION.

President Young called the meeting to order at 10:45 o'clock. The secretary read a letter from First Vice-president E. W. Rollins of Denver, regretting his enforced absence from the convention. Similar letters were also read from L. A. Duncan, Birmingham, Ala., C. H. Wilmerding of Chicago and Edward L. Nichols of Ithaca, N. Y. A letter was also read from Mr. Marconi of London, regretting that it was impossible for him to attend the convention.

The feature of the programme was the presentation of two papers, by Herbert A. Wagner on "Single-phase Distribution," and Louis A. Ferguson on "Underground Electrical Construction." The entire session was given up to this discussion and was largely attended.

Mr. Wagner's paper was first in order and the discussion was opened by Mr. Crosby of Washington. Mr. Emmet of Schenectady, Mr. Ferguson of Chicago and Mr. Perkins of Youngstown took up several features of the subject and discussed them in detail.

The chairman next introduced Mr. Ferguson of Chicago, whose paper on "Underground Electrical Construction" was illustrated by lantern slides. Mr. Stetson, who presided at this session, opened the discussion by relating his own experience. Mr. Gille of St. Paul and Mr. Barstow of Brooklyn continued until the time for adjournment.

WEDNESDAY AFTERNOON'S SESSION.

President Young called the meeting to order at 3:20 o'clock, and asked whether the members desired to discuss further the paper of Mr. Ferguson. Mr. Davis took up the subject, asking for data as to the amount of business done per block and what was the income per 16 candle power lamp per thousand feet of duct. Mr. Ferguson replied that he had not these figures at hand, but could easily obtain them from the records. This closed the discussion.

The president announced that the next paper was entitled "Some Notes on Underground Distribution of Two-phase Current in New York City," by E. A. Leslie of New York. Mr. Leslie read the paper, and as there was no discussion, the president announced the next subject for consideration to be a paper on "Means of Attaining Safety in Electrical Distribution," by W. L. R. Emmet of Schenectady, N. Y. The discussion of this paper was opened by Mr. Sachs of New York, and Mr. Barstow and others participated.

In closing the discussion Mr. Greene of Schenectady said: "There is one point which I think you will hardly appreciate unless you have had some experience with extensive secondary mains; that is, the importance of securing united action on the part of electrical interests to secure a modification of the existing Fire Underwriters' rule. As Mr. Emmet has pointed out, it is not only common practice abroad, but it is compulsory to ground the neutral. It is certainly the only practical method for any extensive system of secondary distribution. It seems to me that the underwriters will not act in the matter until pressure is brought upon them, and I think this association is one of the best channels through which to bring pressure to bear. I would like to suggest the advisability of the appointment of a special committee to consider the question, which shall be authorized to settle the matter, or to formulate a report and present it at the next meeting of the association. It seems to me considerable progress should be made during the next few months, and that the committee should take the matter up actively in connection, perhaps, with a similar committee from the American Institute of Electrical Engineers, if that association would be willing to appoint a committee, because any rule opposed to good engineering practice is bound to be modified sooner or later. We want that rule modified before we



GENERAL VIEW OF EXHIBITION HALL.

it stands first among the cities of this country and in many ways is the first city of the world; in electrical progress it has no equal. Within its limits are located 35 electric-light stations, which furnish more than 1,000,000 incandescent lights and more than 30,000 arc lights, and at least 30,000 horse power in electric motors. The capital invested for carrying on this great business is nearly \$100,000,000.

"It may interest you to know that in 1867, in the city of Brooklyn alone, there were 10 street-railway companies, having 678 miles of track and a capitalization of \$55,000,000. In that year these railway companies carried 223,180,504 people. To-day every transit company in the borough of Brooklyn is equipped or about to be equipped with electricity for its motive power; the capitalization is \$150,000,000, and 236,980,010 people were carried by this vast system in 1897. Electricity, together with the inventive genius of honored members of this association, has made this wonderful change possible.

"The electric light," in one of the prominent Brooklyn papers speaking of the trolley, says, "Their power is being performed a heart-like function; they are pumping the blood of the city, through their arteries, where the flow was sluggish—they were almost dead." I think not only are the electric lights entitled to great credit for a work well done, and to the honor of being the first to use the electric light, but the electric light companies are also entitled to great credit for bringing up the electric light to the outside world.

"The success of the electric light business has

for the benefit of this association papers by some of its prominent members on practical every-day subjects which are nearest the hearts of electric-light men and which help them in the operation of their own plants and prove to them the value of this association. It will be very pleasing for you all to know that never in the history of the National Electric Light association has its membership been so great, and never so much interest shown in its success.

"I now declare the twenty-second convention of the National Electric Light association opened and ready for the transaction of business."

READING OF PAPERS.

The first business announced was the reading of a paper on "A Local Transmission System—Development and Operation," by Mr. W. S. Barstow of Brooklyn. The discussion was opened by Mr. Ferguson of Chicago, and he was followed by Mr. Creden of Chicago, Mr. Walker of Brooklyn, Mr. Wagner of St. Louis, Mr. Rice of Brooklyn, Mr. Von Pohl of New Orleans and Mr. Barstow.

COMMUNICATIONS.

The secretary read an invitation from the Edison Electric Illuminating company of Boston, inviting the members of the association to inspect its several stations. The secretary also read letters of regret from Mr. Charles E. Brush of Cleveland and Professor Henry T. Bovey of Montreal, who were unable to be present; also letters from Mr. Samuel Insull of Chicago and Mr. Frederic Nicholls, stating that they would arrive later in the session.

The secretary announced that an automobile ride



Prindle Pump Company.
 Baker & Co.
 Adams-Bagnall Electric Company.
 Dale Company.
 General Incandescent Light Company.

Crocker-Wheeler Company.
 Stanley Electric Manufacturing Company.
 Bossert Electric Construction Company.
 Columbia Incandescent Lamp Company.
 Columbia Automobile Company.
 Wagner Electric Manufacturing Company.
 Northern Electrical Manufacturing Company.

Bullock Electric Manufacturing Company.
 Cling-Surface Company.
 American Circular Loom Company.
 American Vitified Conduit Company.
 H. B. Camp Company.
 Orient Electrical Company.

John A. Reebing's Sons Company
 Western Electrician
 Safety Insulated Wire Company.
 American Electric Vehicle Company
 American Electric Specialty Company
 McCay Engineering Company.
 Fischer Equipment Company

burn up several million dollars of property. This seems to me to be inevitable, unless the grounding is allowed formally by the rules and not informally and against the rules, as in some places to-day. The accident which occurred at New Orleans is bound to be repeated under the conditions which exist now, particularly where there are overhead conductors. I would like, therefore, to suggest the advisability of the appointment of a special committee to consider the matter, the committee either to report to the next convention, or to take the matter up with the underwriters."

Mr. Ayer: "I wish to second that motion."
The motion was put and carried.
The president: "We will take that matter up in the executive session and act upon it."

COMMITTEE REPORTS.

The report of the committee on "Standard Candle Power of Incandescent Lamps," of which Dr. Louis Bell of Boston was the chairman, was next in order. Dr. Bell was not present, and Mr. Ayer, another member of the committee, was called upon. He said: "Dr. Bell is chairman of this committee. He is not present, and I have not been able to get any information from him in regard to the progress of the work in the shape of a formal report. As a matter of fact, I know there has been nothing done in the past year. The committee is authorized to go ahead and complete a standard method of testing, and recommend a standard form of photometer, and in a general way carry to a

James I. Ayer of Boston, G. W. Hubley of Louisville and H. H. Fairbanks of Worcester, Mass. The first paper to be read was one by H. M. Atkinson of Atlanta, Ga., on "Alternating-current Generation and Distribution—Changes Contemplated in Atlanta." In the discussion which followed Mr. Crosby of Washington, Mr. Doherty of Madison, Mr. Edgar of Boston, Mr. Scovil of Cleveland, Mr. Dunham of Hartford, Mr. Coughlin of Worcester, Captain Brophy of Boston, Dr. Kershner of Louisville, Mr. Davis of Williamsport, Mr. Ayer of Boston, Mr. Bean of St. Joseph, Professor Goldsborough of Lafayette, Mr. Brown of Columbus and Mr. Hoag of Cleveland took part. Upon suggestion of the president the subject of "Service for Automobiles—What Are We to Do With Them?" was discussed, Mr. Lieb of New York, Mr. Edgar of Boston, Mr. Doherty of Madison, Mr. Scovil of Cleveland and Mr. Crosby of Washington participating.

RESOLUTIONS ADOPTED.

A resolution was adopted embodying a suggestion by Mr. Doherty of Madison that the president be authorized to appoint a committee to investigate the photometric value of arc lamps.

Mr. Wright offered the following resolution, which was adopted:

"Resolved, That the thanks of the Electric Light association are hereby tendered to the New York Electric Vehicle Transportation company, the Columbia Automobile company, A. L. Riker Electric

Crosby and Davis, at the conclusion of which the committee was authorized to take whatever further steps might be deemed advisable in its judgment to secure such amendments to the freight classification as were desirable and proper.

RESOLUTIONS ADOPTED.

Mr. Ayer offered the following resolution, which was adopted:

"Resolved, That the thanks of the National Electric Light association be and are hereby extended to Mr. Charles E. Tripler for his great kindness and courtesy in preparing a lecture, with experimental demonstrations upon the qualities of 'Liquified Air,' for the members and delegates at the twenty-second convention in New York city.

"Resolved, That a copy of this resolution be sent to Mr. Tripler by the secretary."

EXECUTIVE SESSION.

The meeting then adjourned to executive session, where the first business was the report of the secretary and treasurer, which showed the following financial transactions during the year:

Receipts and cash on hand.....	\$7,188.90
Disbursements and liabilities.....	4,551.85
Balance	\$2,637.05

NEW OFFICERS.

The report of the nominating committee was then presented:

For President, S. T. Carnes, Memphis, Tenn.
For first vice-president, O. T. Crosby, Washington, D. C.

For second vice-president, J. B. Cahoon, Elmira, N. Y.

For members of the executive committee, E. F. Peck, New York; William M. Brock, Paterson, N. J.; C. E. Scott, Bristol, Conn.

Mr. Wright moved that the report of the nominating committee be received, and that the secretary be instructed to cast the ballot for the association for the gentlemen nominated. The ballot was accordingly cast and the gentlemen duly elected.

Mr. Crosby of Washington proposed a vote of thanks to Mr. Young, saying: "He has had, as we know, for years a ripe knowledge of the business we are engaged in, and his interest and industry in it have been unremitting. I do not believe that we could have had a better president to keep in for a second term, were it not for the fact that the practice has been established of changing every year. I move that the association tender a vote of thanks to Mr. Young for all he has done for the association during his incumbency." The motion was carried.

President Young acknowledged the compliment, saying: "I sincerely thank you for your kindness in this matter. I did not feel that I was the right person to be selected for this position when you elected me in my absence at Chicago. I thought it was rather hard lines to have the position thrust upon me; but I felt that it was certainly a very great honor. I have tried my best to make this meeting a success, and I wish to thank every member individually for the great help he has given me, as without that help it could not have been a success. As it is, I think the meeting has been a great success and that the interest of the members present has been well sustained. I want to thank every member for his attention and earnest efforts in connection with it."

INSTALLATION OF OFFICERS.

Mr. Crosby and Mr. Scovil were appointed a committee to escort President Carnes to the chair.

President Carnes said: "This is entirely a surprise to me, for I had no intimation of your intention until 15 minutes ago, and if I serve you with any sort of satisfaction, it will be another surprise to me. I am most highly gratified at this honor which you have shown me and will make every effort to serve you rightfully and faithfully. I could not make a speech if I tried, but having assumed the office, I promise you to do the best I can."

Messrs. Crosby and Cahoon were then installed and made brief remarks of an appropriate character, after which the meeting adjourned.

Exhibition and Convention Notes.

Charles E. Hague represented the Ansonia Brass and Copper company.

The Northern Electrical Manufacturing company presented a number of types of Northern motors.

J. E. Way of the New York office of R. Thomas & Sons company of East Liverpool, O., was on hand.

The Adams-Bagnall company of Cleveland presented a most attractive exhibit of its several styles of modern arc lamps.

W. N. Pinckard of the Westinghouse Electric and Manufacturing company's Chicago office mingled with the boys.

Two men who were warmly welcomed were Messrs. Boyer and Scribner of the western office of the General Electric company at Chicago.

The American Technical Book company of New York announced the publication of a new electrical story, "The Lord of the Dynamos," which may be procured by sending a postal card to the company at 23 Duane street.

[Continued on page 302.]



PARADE OF AUTOMOBILES.

conclusion a method of establishing and determining a standard lamp for station work. The work that has been done is considerable and has reached an advanced point, and I think the methods recommended and agreed to should be carried out. It only needs the appointment of a committee that will give the matter further attention, simply executing details. The work has been outlined, and complete data gathered, and our decisions arrived at after consulting with the lamp manufacturers, as well as users. We seem to have arrived at fair recommendations, but only a trial will give them any status in my opinion. I suggest that some action be taken to continue the committee and perhaps change its members, and have the work prosecuted to completion."

The president: "I think we will take that question up also in executive session, and a committee will no doubt be appointed to continue the work, because it should be brought to completion in the interests of us all."

There was no report from Mr. Armstrong, the chairman of the committee on "Legislation Regarding Theft of Electric Current."

A paper was then read on "Tram Formers; Iron Lamps; The Remedy," by G. Wilbur Fisher of Louisville, Ky., and was discussed by T. L. Doherty of Madison, Wis.

EVENING SESSION.

The president, in closing the session, announced that there would be an evening session at eight o'clock. Mr. Calvin W. Rice of Brooklyn presented a paper on "The Development of the Electric Lamp." Slides illustrating the same were shown and the session adjourned to executive session.

THE FOLLOWING MORNING'S SESSION.

President Young called the meeting to order at 10:15 and immediately appointed as the committee on the officers for the ensuing year

Motor company, the Indiana Bicycle company and the Fischer Equipment company, for the courtesies extended by them to the ladies of the convention, in connection with the automobile ride to Grant's tomb and Columbia University, Wednesday afternoon, May 24th.

"Resolved further, That the secretary send a copy of this resolution to each of the concerns mentioned."

Mr. Dunham offered the following resolution, which was adopted:

"Resolved, That the thanks of the National Electric Light association be and are hereby tendered to Columbia University and to Professor G. F. Sever, of its electrical engineering department, for the courtesies and hospitalities extended to the ladies of the convention on the occasion of the automobile ride, Wednesday, May 24, 1899."

THURSDAY AFTERNOON'S SESSION.

President Young called the meeting to order at 3:20 p. m.

The secretary read an invitation from the Edison Electrical Illuminating company of New York, inviting the members of the association to visit its station; also an invitation from the National Association of Municipal Electricians to attend the fourth annual convention of that association, to be held at Wilmington, Del., September 4th.

REPORTS OF COMMITTEES.

Paul Spencer, when called upon for the report of the committee on "Standard Specifications for Electrical Apparatus," stated that while considerable work had been done by the committee, no formal report would be presented, and, on motion, the committee was continued.

Mr. Ayer then made a verbal report of the committee on "Amendments to Freight Classification." The discussion ensuing on this report was participated in by Messrs. Davenport, Young, Bean,

Gates & Randolph.

The firm of Gates & Randolph is new, but it is composed of two of the most experienced salesmen in the electrical business.

Robert J. Randolph commenced his career in the electrical field in the early days of electric-lighting with Chas. J. Vandepoele in the old shop of the Vandepoele Electric company, located on Canal street, Chicago, back in the early '70's. The first machine the Vandepoele company built that would run five arc lights was sold by Mr. Randolph to the Rockford Boat Works, and that machine is still running. Mr. Randolph well remembers the first 40-light ma-



ROBERT J. RANDOLPH.

chine that was made, which was a "Jumbo" and quite a wonder to the electrical fraternity. This machine was installed at Freeport, Ill.

After the Vandepoele company was absorbed by the Thomson-Houston Electric company, Mr. Randolph engaged with the Excelsior Electric company in Chicago until the Chicago office was closed. He then went to Cincinnati and was manager of the municipal lighting and railway department of the Cincinnati district of the General Electric company. When the Excelsior company again opened its office in Chicago, Mr. Randolph resumed the management and remained with that company until the Chicago office was finally closed, slightly over a year ago. He then became manager of the Sterling Arc Lamp company of New York, with which he remained until May 1, 1899, when he formed a co-partnership with Mr. Gates. Mr. Randolph has installed a large number of plants of all kinds, and his list of friends and acquaintances among electrical men is very extended.

J. Holt Gates started his electrical career in Chicago with Westinghouse, Church, Kerr & Co. in 1885. That firm had just taken the agency of the Westinghouse Electric and Manufacturing company,



J. HOLT GATES.

which shortly before this had been organized in Pittsburg. Mr. Gates afterward removed to Pittsburg, where he spent a year in the shops of the company, learning the mechanical and electrical details. He then went to Texas, where he was manager of the Westinghouse company's interests in the South for three years. From there he returned to Pittsburg, and then to Chicago, finally leaving the Westinghouse company after seven years' service with it to take the sales managership of the Siemens & Halske company of America, which had just then been formed. Subsequently, Mr. Gates went into business for himself, being agent for various electrical companies in Chicago during the last five years.

Mr. Gates has been well-known to the trade during the last two years as western agent for the Walker company, having installed some very large plants during that period.

The experience of both the members of the firm in selling, engineering and installing alternating-current, arc-lighting and railway plants is extended, and some of the most successful plants in the country have been sold by them. This wide experience will enable them to successfully handle the projects they have now in contemplation in their new enterprise. They now act as western agents for the sale and installation of the direct-current apparatus manufactured by the Triumph Electric company of Cincinnati, O.; the alternating-current apparatus of the Warren Electric Manufacturing company of Sandusky, O.; the instrument business of the Empire Electrical Instrument company of New York; the switchboard and specialties of F. A. La Roche & Co. of New York; the business of the Sterling Arc Lamp company of New York, and Elmer P. Morris' rail-bond, with various other details. The office and salesroom of Gates & Randolph are at 13 and 15 Monadnock block, Chicago.

Incandescent Lamp Burns Hole in Partition.

It is well known that incandescent lamps give out a considerable degree of heat, but because the filament "burns" in a vacuum and is surrounded by a tightly sealed glass bulb the general user is apt to minimize the fire hazard from the contact of the lamps with, or close proximity to, inflammable materials. Fires have resulted from this fancied security, and it behooves window dressers and others



INCANDESCENT LAMP BURNS HOLE IN PARTITION.

who arrange masses of filmy fabrics near incandescent lamps to remember that the steady heat of the bulbs may cause fire, after a time, to any substance that will readily smoulder and burst into flame. The danger may be a remote one, but it nevertheless exists in some degree and should be guarded against.

The photograph herewith reproduced shows the heating effect of a 32 candle power lamp left hanging against a wooden partition. It was made for George W. Wilson, chief electrical inspector of the Boston Fire Underwriters' Union about three months ago. The lamp was pendant on a 110-volt circuit and suspended from a fusible rosette. For the convenience of mechanics who were at work in the room the cord was attached to a nail and allowed to hang against a freshly finished sheathing. The lamp was left burning at 5 p. m. and the result was not discovered until 7 a. m. the next day. The lamp had burned the sheathing sufficiently to clear itself from contact. Absence of draft prevented serious fire in this instance, but the lesson to be drawn is an obvious one.

Annual Dinner of the Chicago Electrical Association.

About fifty electrical men attended the annual banquet of the Chicago Electrical association, held on May 10th, at the Technical Club, Chicago. Mr. E. W. Jewell acted as toastmaster, and the following-named gentlemen responded to toasts: Mr. C. J. Warner, "Electricity of Long Ago;" Prof. H. S. Carhart of the Michigan University, "Education;" Lieut. F. B. Badt, "Mathematics;" Mr. E. P. Warner, "The Construction of Electrical Generating Apparatus."

Numerous informal toasts were responded to, and Mr. Sewell, chairman of the reception committee, extended to the visitors a hearty invitation to attend the technical meetings of the club in the fall. Mr. J. M. Hollister was chairman of the banquet committee and in charge of the arrangements, and deserves credit for the successful meeting.

The list of the names of those who were present is as follows:

- | | |
|---------------------|-----------------|
| Harold Almert | E. J. Jones |
| S. G. Arnold | F. P. Jewell |
| F. B. Badt | W. G. Hyde |
| H. A. Buebel | G. E. Kane |
| A. M. Blumenthal | J. H. Kent |
| E. C. Blackman | Z. E. Leonard |
| Prof. H. S. Carhart | G. M. Mason |
| M. A. Caster | C. C. McMan |
| C. K. Clark | W. A. Motter |
| A. B. Conover | W. G. Mott |
| J. R. Crasht | F. F. Osh |
| C. E. De Crow | Albert Scheibel |
| G. E. Ditzler | G. H. Sewell |
| H. G. Dimick | I. W. Smith |
| E. Douglas | F. J. Smart |
| G. M. Finney | C. H. Torday |
| A. H. Ford | Mr. Varley |
| T. G. Grier | C. J. Warner |
| H. I. Hadaway | E. P. Warner |
| W. A. Harding | W. J. Warden |
| J. G. Hieckox | J. G. Weart |
| F. S. Hickok | J. C. Whitridge |
| J. M. Hollister | C. Wiler |
| W. K. Howe | G. P. Wynn |

American Institute of Electrical Engineers.

The sixteenth annual business meeting of the Institute was held in New York last week. The annual reports of the council and treasurer were presented. The total membership on May 1st was 1,133, being a net gain of 35 during the year. All debts were reported paid. The cash balances in various funds amounted to \$5,702.74. Other assets were \$5,067.75. The counting of the ballots showed the election of the council nominees, as follows: President, A. E. Kennelly; vice-presidents, J. W. Lieb, Jr., Chas. F. Scott, L. B. Stillwell; managers, C. O. Mailoux, S. Dana Greene, C. S. Bradley, W. D.

Weaver; secretary, R. W. Pope; treasurer, Geo. A. Hamilton.

A paper was presented by Frank J. Sprague, past president, on the "Multiple-unit System of Electric Railways," which was fully illustrated by a working model and lantern slides. The paper was discussed by John B. Blood, Jr., A. H. Armstrong, H. Ward Leonard, F. V. Henshaw and others.

At the meeting of the executive committee in the afternoon the following-named associate members were elected: Louis E. Bogen, Cincinnati, O.; Paul Bonyng, Brooklyn, N. Y.; Joseph H. Bowman, Chihuahua, Mexico; Ellis Eugene Brown, Kingston, Pa.; Walter E. Chappell, United States Navy; Louis A. Herdt, Montreal, Canada; Albert C. Johnson, Willmar, Minn.; Thos. J. Johnston, Schenectady, N. Y.; John F. Kelly, Pittsfield, Mass.; Chas. Edwin Knox, New York, N. Y.; John F. Macartney, London, Eng.; Robert D. McCarter, Jr., Schenectady, N. Y.; Robert McClenathen, Ithaca, N. Y.; A. Center Middleton, Schenectady, N. Y.; E. H. Mullin, New York, N. Y.; Harry Nathan Ramsey, New York, N. Y.; Geo. P. Robinson, Milwaukee, Wis.; Frank Robert Schoofield, Boston, Mass.; Chas. Ralph Sturdevant, Lexington, Ky.; S. E. Whitine, Cambridge, Mass.

The following-named associate members were transferred to membership: Henry Ackley Lardner, New York, N. Y.; Arthur E. Kennelly, Philadelphia.

The general meeting of the Institute at Boston will be held on June 25th, 27th and 28th.

Railway Telegraph Superintendents.

The Association of Railway Telegraph Superintendents, which had been holding its tenth annual convention in Wilmington, N. C., left there for Norfolk, Va., on May 18th. The association decided to hold its next annual session in Detroit on the third Wednesday of June, 1900. A feature of the convention was a successful demonstration of wireless telegraphy. Thomas A. Edison attended the convention as guest of the association. The concluding session was held in Norfolk.



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CONVENTIONS AND EXPOSITIONS.

- New York Electrical Exhibition, Madison Square Garden New York, May 27th to June 3d.
International Electrical Exposition in Commemoration of Volta Cent. Ita. 7. May 22th to October 25th.
American Institute of Electrical Engineers, Boston, June 26th to 29th.
American Society of Civil Engineers, Stockton Hotel, Cape May, N. J. June 27th to 30th.
Canadian Electrical Association, Hamilton, Ont., June 25th to 29th.
Southern Telephone Association, Memphis, Tenn., July 5th.
American Association for the Advancement of Science, Columbia Ave., Chicago, 27th to 29th.
National Association of Municipal Electricians, Wilmington, Del., September 7th to 10th.
Providence Exposition of American Manufactures for Export, September 14th to November 1st.
Chicago Exposition of Electrical Arts, Tattersall's, September 25th to October 1st.
International Exposition of Manufactures, Berlin, Germany, 1897 to 1898.
American Street Railway Association, Tattersall's Chicago, October 17th to 20th.

In the report of the proceedings of the South-western association's convention at Austin, which is presented on another page, mention is made of the discrimination shown by the insurance companies against electrical interests.

A comprehensive report of the proceedings of the convention of the National Electric Light association at New York is presented in this issue, although the sessions extended beyond the regular day for going to press.

The subjects selected for discussion at the New York meeting proved to be attractive, judging from the general interest shown. It is becoming more apparent each year that the most valuable paper is the one that provokes discussion and prompts inquiry.

A correspondent of the New York Sun advances an interesting theory in explanation of the waves of prosperity and depression in the commercial world.

From years of study and observation, I am satisfied that the different waves of electricity have different effects on men's minds; and if a preponderance of bear electricity prevails, down goes the market, and the bulls lose their courage.

This correspondent does not explain the differences that are noticeable in the duration of these waves, the means through which electricity operates and the source of the power exerted.

Many who have examined the numerous types of mechanically propelled carriages which are now being introduced into general use in large cities have criticized the lack of ingenuity displayed by the builders of these vehicles.

Everything about the automobile is suggestive of the horse—the dashboard, side step and raised box, as well as the general form of the rig, being reminders of that faithful animal.

The cooling action of electric sparks has been the subject of an investigation by E. Villari, the results of which have been announced in a communication which has been summarized by the London Electrician.

It is significant that the American Society of Mechanical Engineers, at the annual meeting in Washington recently, adopted resolutions directing its members to urge upon Congress the necessity for relieving the present overcrowded condition of the Patent Office and providing sufficient room, force and facilities for the prompt and proper execution of its work.

The most pressing need of the Patent Office is additional room. With a sufficiently large building the present working force of the office would be enabled to do its work promptly.

FIRST ANNUAL CONVENTION

Of the Southwestern Gas, Electric and Street Railway Association.

[Special correspondence of the Western Electrician.]

Austin, Texas, May 20.—The Southwestern Gas, Electric and Street Railway association held its first annual convention in this city on May 17th, 18th and 19th. About 100 delegates were present, mostly from Texas. The territory embraced in the association is Texas, Louisiana, New Mexico and Mexico.

The convention held its business sessions in the parlors of the Driskill Hotel. The first day's session was called to order by President Carl F. Drake of Austin, who made a few remarks, welcoming the visitors to Austin. He was followed by Mayor John D. McCall, who made a happy welcoming speech in behalf of the citizens of Austin. The response to Mayor McCall's address of welcome was made by T. D. Miller of Dallas, Texas, on behalf of the association. This completed the exercises of the first day's session, an adjournment being taken until the following morning at 10 o'clock.

The visitors spent the afternoon in riding about the city, visiting Hyde Park and other places of interest.

SECOND DAY'S PROCEEDINGS.

The second day's business session was devoted to the reading of reports of President Drake and Secretary Wells. President Drake's report contained the following interesting statement:

There is scarcely a doubt that the rates of insurance, as they heretofore have been applied by the state board of underwriters, have in many cases been exorbitant and in some cases almost prohibitive. This we believe with proper attention could be satisfactorily adjusted. Your state Legislature appointed committees whose duty it is to investigate and pass upon many bills which are of direct interest to us. These gentlemen, while using their best judgment, are neither practical electricians nor managers of gas and street-railway plants, and in order to arrive at an honest and just verdict they must be educated. There is probably no one within the sound of my voice who is more bitterly opposed to what is known as "lobbying" than your president, but in the many years that I have lived in the capital city I have seen many cases where the legislative body was as anxious to secure information as were the interested parties to give it. We therefore think that a committee on legislation would be wise.

Secretary Wells' report reviewed the period of organization and the details connected with the consolidation of the several interests involved. He urged the members to take a personal interest in the subject of increasing the membership.

Mr. T. D. Miller of Dallas read an interesting paper on the subject of the "Science and Art in Selling Gas," which was discussed by several members.

The afternoon of the second day was enjoyably spent by the delegates and their wives in a boat ride on Lake McDonald and an inspection of the large municipal light and power plant. At night the visitors were tendered a reception and musicale at the Driskill Hotel.

THIRD DAY'S SESSION.

The following-named officers of the association, to serve during the ensuing year, were elected immediately upon the opening of the third day's session: President, T. D. Miller of Dallas, Texas.

First vice-president, J. F. Strickland of Waxahachie, Texas.

Second vice-president, C. A. Yeager of Laredo, Texas.

Third vice-president, W. E. Hamilton of Shreveport, La.

Board of directors, Carl F. Drake and Frank E. Scovill of Austin, Texas; E. Dysterud of Monterey, Mexico; Fred Fries of San Antonio, Texas; E. L. Wells of Marshall, Texas; J. C. Cullinane of Denison, Texas.

Commercial Club of that city, made an address on the subject of "Means of Encouraging Diversified Use of Electric Current."

Among the delegates in attendance were the following-named gentlemen: C. W. Hobson of Waco, G. J. Wille of Marlin, A. E. Rathbone of Victoria, A. E. Judge of Tyler, J. C. Kirby of San Antonio, W. W. Vaughan of Austin, T. F. Harwood of Gonzales, J. S. Bonner of Houston, J. F. Strickland of Waxahachie, J. L. Sale and T. D. Miller of Dallas, Fred Fries of San Antonio, L. J. Palfrey and T.

Volta was a great step in advance in electrical science, and Volta has been honored by electricians by the adoption of his name for the unit of electromotive force. Volta also invented the electrophorus, the condenser and the straw electrometer. He was born in Como in 1745 and died in the same city in 1827. He was acquainted with nearly all the scientific celebrities of his day and received many honors. Now, a century after the date of his great invention, an important electrical exhibition is held by his fellow-townsmen in his native city to do honor to his name.

For two years the preparations for this exposition, held in connection with an exhibition of the silk industry, which is of great importance in that part of Italy, have been in progress. Fig. 1, a reproduction of the beautiful poster is used to announce the event. This is really a work of art, showing intelligent symbolism, excellent draughtsmanship and charming coloring. The mechanical execution, too, is very good. As will be readily seen, one of the female figures, with the voltaic pile and the garland for the great physicist, represents Electricity; the other, with shuttle and fabric, the Silk Industry. The nation but imperfectly represents this fine piece of work.

Fig. 2, reproduced from the New York Tribune, shows the buildings of the exposition. A Como correspondent of the same journal notes that with the exceptions perhaps of the elder and younger Pliny—who were both born there—Volta is the most memorable native of Como. A statue of Volta, by the sculptor Marchesi, may be seen on the west side of the town, near the quay. It is greatly to the credit of the townsfolk of Como that they have organized and got up without governmental subsidies and entirely at their own expense this international exhibition of electricity, which will be open until the end of October.

The exhibition buildings are erected on a large square, called the Piazza d'Armi, and include the public gardens facing the Lake of Como, reaching across the little valley extending from Mount Brunate to Mount Bisbino, and opening on the north with a fine view of the Torno promontory. The exhibition inclosure comprises about 38,000 square meters, and its total area exceeds 60,000 square meters. There are eight large rectangular galleries and three halls. The center hall is circular and forms the main building of the exhibition. It contains a statue of Volta, and has no windows—the light coming in from the top through an elaborate glass-dome roof of various colors.

The scientific instruments, books and manuscripts that belonged to Volta have been collected and may be seen in the southern gallery. Another gallery contains all the portraits of Volta, together with his furniture and domestic relics. At the extremities of the two semi-circular galleries adjoining the façade two large lighthouses have been erected. Each is 40 meters in height, and is surmounted by a huge voltaic pile. One of these lighthouses is provided with an electric elevator to enable visitors to enjoy the superb view of the Lake of Como. Signor Linati, a Milanese architect, designed the exhibition buildings, which do him great credit.

The thrifty inhabitants of Como are justly proud of their electric exhibition, and in one of the rooms may be seen letters from Lord Kelvin and from Thomas A. Edison, encouraging the organizers of the exhibition and expressing graceful tributes to the memory of Volta and recognitions of the incalculable value of his researches. During the coming summer a congress of electricians will meet at the Como exhibition, and it is expected that many interesting papers will be read there, notably one by



FIG. 1. ELECTRICAL EXPOSITION AT COMO.—POSTER ANNOUNCING VOLTA CENTENARY.

M. Wortham of Houston, W. S. Rothwell and T. H. Stuart of Waco, J. R. Cox of Galveston, J. R. Cullinane of Denison, J. C. Ward of Beaumont and Charles F. Yeager of Laredo.

Electrical Exposition at Como.

A dispatch from Como, Italy, says that King Humbert opened the International Exposition of

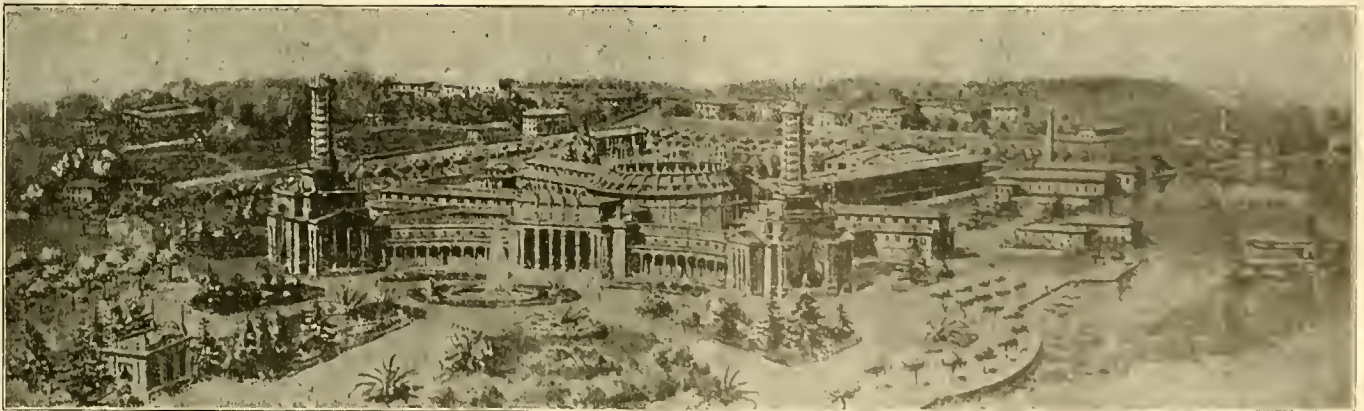


FIG. 2. ELECTRICAL EXPOSITION AT COMO.—VIEW OF GROUNDS AND BUILDINGS

Secretary, T. H. Stuart of Waco, Texas. Treasurer, Fred Fries of San Antonio, Texas. Waco, Texas, was selected as the place for holding the next convention.

J. F. Strickland of Waxahachie, Texas, read an interesting paper on "A Model Plant under Model Management—What Both Should Be Like, Viewed From a Practical Standpoint." T. H. Stuart of Waco, Texas, contributed a paper on the subject of "Summer Attractions for Street Railways," and C. L. Wakefield of Dallas, who is president of the

Electricity and the National Exhibition of the Silk Industry at that place on May 20th. The electrical exhibition is held in commemoration of the centenary of the invention by Count Alessandro Volta of the electric pile, which was first described early in the year 1800. The pile consisted of a number of disks of zinc and an equal number of silver or copper disks. The zinc and copper plates were in contact, and each pair was separated by porous matter which was kept moist. From it currents of electricity were procured. The construction of this bat-

teroni in reference to the latest development of wireless telegraphy.

An electrical society has been formed by the members of the Young Men's Christian Association of Montreal. The members of the society are students of the class in practical electricity, presided over by Prof. L. A. Herdt of McGill University. The meetings of the electrical society are to be held monthly during the summer for discussions, excursions and visits to large electrical plants. etc

DEVELOPMENT OF THE TELEPHONE FIELD.

Multiple Switchboard for Large Exchanges.

Among the new features in telephone equipment put on the market by independent manufacturers, the new multiple switchboard of the Stromberg-Carlson system possesses a special interest for large exchange builders. The board is not of the divided-multiple type, but each operator is within reach of every subscriber's jack in the system, enabling any operator to complete every connection received in the position. This eliminates trunking or transferring connections from one operator to another, which is necessary with practically all the connections in a trunking switchboard system.

It is claimed that one-half the usual number of operators can make as many connections and give far quicker service than with the old-style board, which not only increases the efficiency of the service greatly, but also reduces the cost of operating to a minimum.

Fig. 1 shows one of the main-line signals used in the central-energy system in the multiple board and also in the regular trunking boards. The signal is controlled by the subscriber. When the receiver is taken from the subscriber's instrument the signal will automatically indicate the number. The disconnect signal is given when the subscriber replaces the receiver. The operator has no drops to restore and is not required to break into a conversation, as the connection is indicated until the subscribers replace their receivers.

For all systems outside of the central energy a drop shutter is employed in place of the visual signal, using the main part of the drop with a catch on the pin extending from the armature and the ordinary form of shutter.

Fig. 2 shows a form of ringing key used.

Fig. 3 is a bank of 20 multiple jacks. These jacks, while small and very compact, are of ample size to allow every detailed part being made strong and durable. They are made of the very best of ma-

of the arm and base has been a source of trouble in the ordinary pattern, most users finding the iron arm very unreliable to use as one conductor. The spring device in the new transmitter here described, it is claimed, makes the contact always sure, as the spring takes up the wear caused by use.

EXTENSIONS AND IMPROVEMENTS.

The Oregon Telegraph and Telephone company is taking up the proposition to connect Tigardville with its system and extending it to Progress.

The Calhoun County Telephone company of O'Hara, Ala., and the Lineville Telephone company will connect their systems. The former already has lines to Anniston, Oxanna and De Armanville.

A new telephone company has been organized at Billings, according to the Lewiston (Mont.) Argus,

the 100 shares of stock and also to include a percentage of profits. The board consulted City Collector Davis, who objected to the city becoming a shareholder in the telephone business, and the board refused to accept the mayor's advice, withdrew the ordinance, and left it with the mayor to sign or veto. The mayor declared that he would veto it.

MANUFACTURERS AND DEALERS.

The Illinois Electric company of Chicago is at work on a new telephone catalogue, which will be ready for distribution about July 1st. It says that this will be the most complete catalogue ever issued, and asks the trade to send for copies.

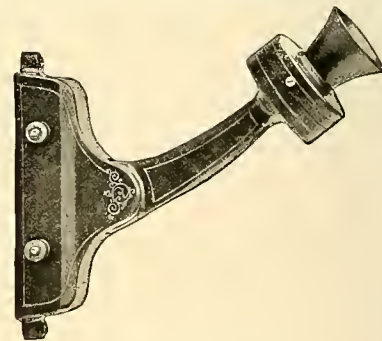
The Missouri River Telephone Supply company of Atchison, Kan., has arranged to represent many of the leading manufacturers of telephone apparatus. A. S. Munsell, manager of the company, has had 14 years' experience, first with Bell companies and later in the independent field, and he has built many exchanges and toll lines west of the Mississippi.

An enlargement of factory facilities has been made necessary by the rapidly growing business of the Kellogg Switchboard and Electric company of Chicago. The old shops at Highland Park are running night and day, 200 men being employed, and in spite of these efforts the company has been falling behind in its orders. A new factory at Jackson and Green streets, Chicago, has been fitted up. It consists of three floors, each 125 feet deep and 75 feet wide, with light on all sides and power. This will give the company 28,125 square feet additional floor-space. Milo G. Kellogg says that the demand for the company's apparatus has increased beyond his expectations. The company is now engaged on several large contracts.

Result of the Monopoly.

[From the Chicago Tribune.]

With the establishment and recognition of its monopoly the Bell company was in position to devote its attention to the development and improvement of the service and the extension of the busi-



A NEW TRANSMITTER.

ness. It commanded the telephone engineering and inventive ability of the country, as it afforded the only outlet for the efforts and products of the men who had been trained in this department. It is true that the telephone has had a remarkable growth, but it is also true that this advancement has been made in spite of the Bell company's policy rather than as a result of its encouragement and assistance. Never for a moment was the public permitted to forget that there was a monopoly and that the owners of it were determined to exact the last farthing. No advancement was contemplated, no extension was considered and no improvement adopted that entailed an expenditure that could not be immediately regained with profit. It was only when the old methods of exchange operation became so cumbersome and expensive as to make further increase impossible that the installation of a new system was admitted to be desirable, and even then the charges were increased so as to more than cover the expense of the new equipment.

INFORMATION WANTED.

The manager of a local exchange company in Texas writes as follows:

I am anxious to increase our revenue by interesting the country people in putting in telephones in their homes. We are at the junction of two rivers, and there are some fine farms along these rivers. We cannot afford to build the lines to all their places, though we have some lines that we can make club lines out of, by letting them bridge on them. We offer to meet the others at the corporation line, the principal trouble being to get them to build these lines. Our country is full of barb-wire fences, but I am afraid that although they might work all right in dry weather, they would not give satisfaction when it was wet. These wires are fastened to the posts with staples. If we could find some suitable material to wrap around them and then drive in the staple so as to insulate them, I think the problem would be solved. What kind of material is best adapted for this kind of work?

A California subscriber submits the following problem:

Can cross-talk be prevented on two parallel single-line grounded telephone circuits running side by side? If so, how?

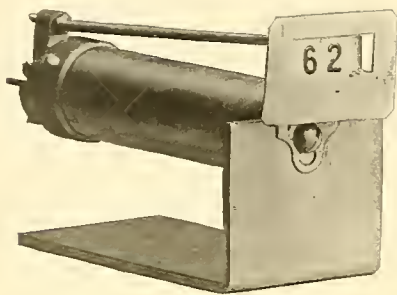


Fig. 1.



Fig. 4.

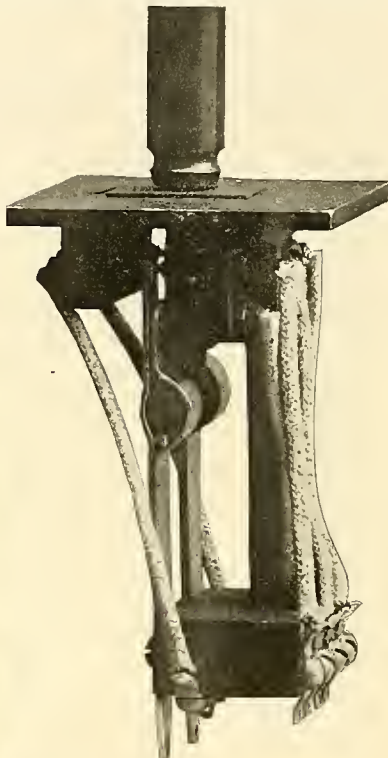


Fig. 2.



Fig. 3.

MULTIPLE SWITCHBOARD FOR LARGE EXCHANGES.

terial obtainable and by the highest class of workmen, and are considered to be the finest pieces of work in this line. In a 5,000-subscriber plant, 5,000 of these multiple jacks are placed in each section, within reach of each operator, besides the regular main-line jacks.

Fig. 4 is a connecting plug.

The multiple-board system is comparatively simple in general principle, but it was found one of the most difficult problems in independent telephony to evolve a board of this kind that would be practical and reliable and also evade existing patents.

A New Transmitter.

In the accompanying cut is illustrated a new transmitter, which is said to contain a number of superior features, and which is placed on the market by the Transmitter Manufacturing company of Grottoes, Va. This company claims to be the largest manufacturer of transmitters in the United States.

The transmitter, illustrated herewith, has a compact and neat appearance. It cannot be affected by moisture, there being no carbon exposed. It is sensitive and of intense direct force. The coils are mounted in the base and are electrically soldered. The coils are very carefully constructed and encased in a wooden box. The transmitter work and finish of the instrument are of the highest grade and guaranteed. The device is especially recommended for long-distance work and will stand, it is said, the most severe tests. The transmitter cup is cast integral with the arm, affording a complete protection for the instrument. The conductor cord runs throughout the center of the arm and through the joint, which obviates the danger of being stretched from its connections. The joint

for the purpose of building a telephone line to Musselshell, crossing through Roundup, a distance of 110 miles.

J. C. Crowley is preparing to establish an independent telephone exchange in Anderson, Ind. Mr. Crowley is said to be an experienced telephone man. He is now engaged upon the preliminary work of building the circuits.

The Sunset Telephone and Telegraph company has commenced the erection of a fine building at San Jose, Cal. The cost of the building alone will be \$12,000. The building will be equipped with switchboards and other apparatus.

Salem, Mass., is the hotbed of telephone competition, and a company has been organized with Henry A. Hale of Salem as president. A hearing is to take place before the aldermen May 31st. This is the third company formed in opposition to the existing service. If granted a franchise the projectors say they will use an automatic system.

The Kinlock Telephone company of St. Louis claims to have 1,040 more paid subscribers than the Bell company. All of the Kinlock instruments are on complete metallic circuits. The company's switchboard is filled and there are 600 applications now on file in the office. An addition to the original switchboard is now being built by the Kellogg Switchboard and Electric company of Chicago.

The Street and Water Board of Jersey City recently passed an ordinance granting the privilege to the Hudson Telephone company to extend its line. The mayor insisted that the company should pay some compensation to the city, and had a conference with representatives of the company, who offered the city 100 shares of stock. The mayor requested the Street and Water Board to withdraw the ordinance and amend it to include the com-

Combined Arc Lamp and Ceiling Fan

The combination of an enclosed arc lamp and a ceiling fan, shown in the accompanying illustrations, is an ingenious and useful application of electricity to interior decoration and comfort. Its usefulness will be especially marked in restricted spaces where there is not room on the ceiling for both arcs and fans.

The motor armature, as Fig. 1 shows, runs around the upper part of the lamp. It is mounted on ball bearings and carries either two or four blades, the speed being 200 revolutions per minute for the former and 170 revolutions per minute for the latter. The blades are 22½ inches long. In winter the armature and blades may be removed, leaving only the

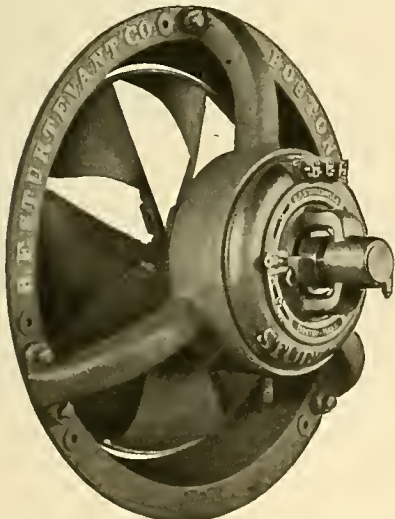


FIG. 1. COMBINED ARC LAMP AND CEILING FAN.

lamp (Fig 2). By the manipulation of a switch either the lamp or the fan alone may be worked, or both together. The lamp is of the long-burning, enclosed type, requiring trimming only after 150 to 200 hours. The combination is made for 110, 220 and 500 volts, and on the 110-volt circuit is said to consume only 5½ amperes with the fan running and the lamp lit. This interesting combination is made by the Interstate Electric company, Cleveland, O.

New Type of Electric Propeller Fan.

Since the B. F. Sturtevant company of Boston, Mass., entered extensively upon the manufacture of electric motors and generating sets, it has been carefully studying the problem of the manufacture of a compact, efficient and convenient type of electric ventilating fan. Exhaustive tests were made



with different types of fan wheels. The result is rendered clear by the accompanying engravings, showing one of the Sturtevant company's electric ventilating fans just put upon the market.

The fan wheel, shown attached to the motor in Fig. 1, has eight blades, rigidly attached to a spider at the center, and held in place by a hoop at the periphery at an angle of approximately 30 degrees. The angle is increased in such a manner that as the center is approached the theoretical velocity of the air remains practically constant. In other words the delivery edge is helical, and the air is picked up on the inlet edge of the blades at low velocity. When well under the influence of the blades the air is accelerated to its maximum velocity, it is claimed, with the least amount of slip. The result is said to be an extremely efficient wheel.

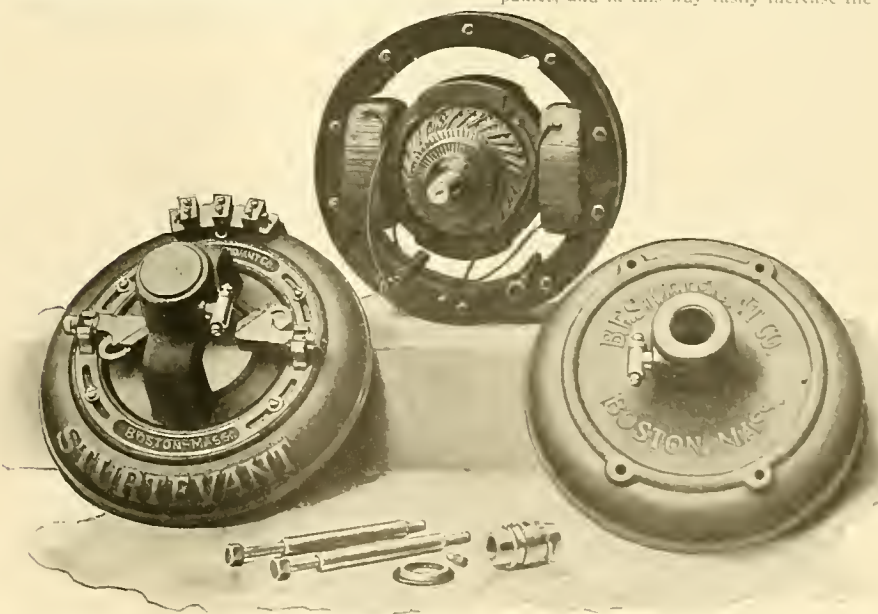
The motor, shown in Fig. 2, with front and rear casings removed, likewise has been the result of

careful study in the attempt to provide a light machine, entirely enclosed, and at the same time to avoid the excessive temperature which is incident to the operation of most enclosed motors. As the result, the manufacturer claims a machine capable of continuous operation for 10 hours with a maximum temperature rise of not exceeding 30 degrees Fahrenheit. A practical efficiency of over 80 per cent, is obtained even with the small-sized motors, and an excess load of 75 per cent, above the rated



FIG. 2. COMBINED ARC LAMP AND CEILING FAN.

capacity may be carried without sparking and without change of brushes. This feature, combined with the small temperature rise, allows of carrying temporary overloads with impunity. The bearings are self-oiling and self-aligning, and are fitted with phosphor-bronze sleeves which are removable from the outer ends of the boxes.



FIGS. 1 AND 2. NEW TYPE OF ELECTRIC PROPELLER FAN.

The wheel is partially enclosed within a conoidal inlet ring (Fig. 1), which decreases the frictional resistance to the entering air and furnishes at the same time a rigid support for the motor, to which it is attached by the tripod hanger.

These fans are built in sizes from 18 inches to 120 inches, with motors designed for either medium or maximum speed and to run at any ordinary direct-current voltage. A speed controller is always provided, by means of which the fan can be efficiently operated at different speeds.

Dr. Pratt Not Appreciated.

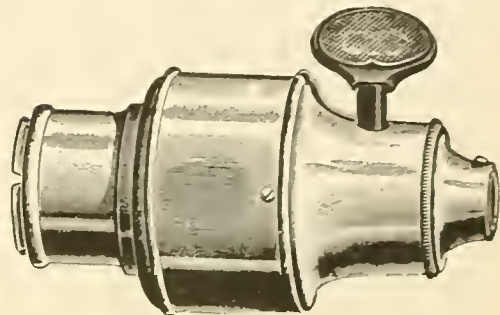
In reviewing the American X-ray Journal, Electricity of London says:

The April number of this journal is disappointing. About half the available space is taken up by a paper which Prof. H. P. Pratt, M. D., Chicago, read before the Erie railway surgeons. Almost at the outset the professor quotes from the Century Dic-

tionary—concerning the possibility of using water as a conductor for electricity. Next, somewhat in a similar way, he quotes the credit popularly ascribed to Professor Pratt for his discovery of the credit of Le. of F. Add. to the order of Pratt, which is that Dr. Pratt, in his famous paper, has shown a great deal of rot. It would be interesting to know whether he received some of the "celestial" light. He is to be congratulated to work to define the matter, referring to his own work on earth, and the water under the earth. There is the question of electricity, a permanent force, which is a part of the atom's structure of matter, and it exhibits the properties of attraction and repulsion. Next time we meet him we shall be glad to recognize it. An electric force, if it is a force of matter, is arranged to parallel, each molecule being a magnet, an equivalent of one. I have only given the best part of this second definition, as there is plenty of room for it. In fact, it is not clear that a suspended needle would not place itself at right angles to the direction of flow, but actually parallel to it. But I must not pile up the agony further. It is necessary to suppose that none of the professor's "hearses" came away under the impression that his were words of wisdom, to which he had been privileged to listen.

McCay Regulating Socket.

The layman consumer asks most naturally in relation to the incandescent lamp, "Isn't there some way to turn it down, so as not to be obliged to burn more



MCCAY REGULATING SOCKET.

light than we want? Isn't there some way to save the current and reduce our bills—some way to apply the current gradually to the lamp and thereby prevent the frequent necessity and expense of lamp renewals—some way to obtain the economy and advantages afforded us by the use of gas, without the many disadvantages of the latter?" And the central-station man with an eye to business propounds to the supply salesman the questions, "Is there no way by which we can supply private consumers with the incandescent electric light on a basis that will enable us to supplant gas and oil as illuminating agents? Is there no way by which we can render domestic electric lighting more economical, and thus open up this large and as yet undeveloped field lying within our reach? Can we not afford the consumer the same advantages and convenience held out to him by the gas companies, and in this way vastly increase the total out-

put of our station and enlarge the revenue derived from the sale of current?" The simple little socket shown in the cut, applicable to alternating-current incandescent lamps, is offered as the solution of this problem. By the use of the McCay socket the candle power of a lamp can be reduced by successive stages from its maximum brightness to a dull red glow, with a considerable saving in current and a greatly increased life of the lamp. An important point is that the amount of electrical energy required by the lamp itself varies according to the light given by it, and can be reduced from 75 watts to less than five watts. In addition to this, the life of the lamp itself is very much prolonged by reason of the gradual, instead of sudden, turning on and off of the current. The importance of these features is apparent.

This socket is manufactured by the McCay Engineering company of Baltimore, Md.

Exhibition and Convention Notes.

[Continued from page 296.]

Stanley & Patterson cigar lighters, most artistically decorated, did considerable "sparking" on their own hook and lighted cigars for convention delegates.

The Morris Arc Lamp company of Chester, Pa., placed its interests in the hands of the Manufacturers and Inventors' Electric company, its New York agent.

It was a pleasant surprise to meet Secretary and Treasurer K. H. Boslog of the Peru Manufacturing company of Peru, Ind. The Peru company is extremely busy at the present time.

The booth of the Western Electrician was decorated with samples of "Modern Advertising in the Most Progressive Electrical Journal in the United States," and attracted universal attention.

W. J. Johnston, former owner of the Electrical World, together with Mrs. Johnston, mingled with their many old friends Wednesday evening at the electrical show after the automobile parade.

Manager of Sales Scribner of the Bryant Electric company of Hartford, Conn., personally represented that concern. To all comers he told of the merits of the new Bryant socket, which he designated "simply perfection."

Ed. Grier, the western representative of the Bryant Electric company, came down with the boys from Chicago, and met Manager of Sales Scribner, who appeared on Wednesday afternoon in time for the automobile parade.

The booth of the New York Telephone company was one of the neatest displays made. This company distributed a circular adapted to interest ladies and others not familiar with the many peculiar advantages of high-class telephonic service.

It was expected that the Diehl Manufacturing company of Elizabethport, N. J., would have its fans at the electrical show, but the company is so far behind with orders that it did not feel warranted in devoting the time and labor to make a show.

Manager R. F. Ross was out with his new electrical paper, the Electrical News, Wednesday morning. Mr. Ross deserves success and starts with the best wishes of his friends. The Western Electrician wishes Mr. Ross every success in his new venture.

Luther Stieringer won praise on every side for his work. His electrical cave proved one of the most interesting attractions. Mr. Stieringer's advice, too, was followed in the festooning of the roof of the garden, and this decoration added greatly to the evening effect.

The hard-working, energetic and courteous assistant to Secretary Porter, Miss Harriet Billings, as usual won the praises of practically everyone present through her painstaking efforts to see that the details pertaining to the secretary's work were faithfully executed.

Where was President Pease of the Hart & Hege-man Manufacturing company? His New York representative, Mr. Taylor, was in evidence, and while Mr. Pease would have been warmly welcomed, he knew his business when he sent Taylor to look after his interests.

New York Manager A. H. Granger of the Orient Electric company, Youngstown, O., gave an example of the energy for which he is noted, by introducing his lamps into a great many of the electric signs used in the show. His design for his own booth was also unique.

The American Electric Specialty company of New York exhibited its direct-reading ohmmeter. This device is admirably designed to measure resistance on a rapidly moving car. Manager Saze of the American company was daily at the booth, explaining this instrument.

Franklin S. Terry of the Weston Instrument company was early at the Murray Hill Hotel Wednesday morning, mingling with his many old Chicago friends. Mr. Terry's work, since connecting himself with the Weston company, has been of a remarkably fruitful character.

The Crocker-Wheeler company of New York made an attractive exhibit. A great variety of the Crocker-Wheeler machines was shown, as well as the frame of one of the company's larger dynamos. This exhibit was really the heaviest in the entire show and did the company credit.

There was never a successful electric-light convention without Messrs. Newton and Baird of the Eddy Electric Manufacturing company of Windsor, Conn. Mr. Baird has been engaged for some months in the West and he reports a most gratifying increase in the company's business in that section.

The Phoenix Glass company of New York took advantage of the presence of so many central-station men to point to its "Catalogue Number 8." The Phoenix company is pushing many attractive forms of electric light globes and shades, adapted for use in an electric light system, both arc and incandescent.

The International Decorative and Mixture Lamp Department of Harrison, N. J., won much praise through its splendid electric-light work, distributed through the show. Few people realize the skill

required in the production of many electric signs. Manager Meadowcroft deserved much praise for his success in this branch.

Dixon Crucible company had an attractive exhibit of graphite specialties. Its lubricating materials are now so well-known that they are always of the greatest interest to the managers of electric-light plants. It is impossible to enumerate the extent of this display, but it is safe to say that every known form of graphite was there presented.

The American Electric Novelty and Manufacturing company made one of the most popular and attractive exhibits. It must have been a revelation to many ladies and gentlemen not familiar with the intricacies of decorative incandescent electric lighting to note the beautiful combination into which can be woven the tiny incandescent lamp.

Secretary Henry G. Adams, Jr., of the Phillips Insulated Wire company of Pawtucket, R. I., in company with J. H. Miller, general manager of the Springfield (O.) Light and Power company, and J. H. Watemann of the United Electric Security company of Boston, was always to be seen on Broadway immediately after the exposition.

The Electric Storage Battery company of Philadelphia made no attempt at a special exhibit, but the battery of this company was used in the Columbia automobiles. New York Manager Blizzard was on hand, and was warmly greeted by his friends from all parts of the country. Mr. Blizzard was one of the pioneers in the electric storage battery business.

The Okonite company made no exhibit beyond some very artistic advertisements in the various electrical journals. "Pick a Good Wire and Enjoy the Music" was the Okonite motto at this convention, and "the banjo," made of Okonite trademarks, played the usual pleasing tune that "never disappoints." Captain Candee and Mr. Manson were on hand.

It was rumored that Captain Frank De Ronde and Purchasing Agent Vandewater of the Standard Paint company were out during the convention with small cans of specially reddened P. & B. paint, but this cannot be vouched for as being absolutely authentic. Nevertheless, P. & B. makes its mark under all circumstances, and this case was no exception.

The Riker Electric Motor company of Brooklyn deserves credit, not only for the exceedingly handsome exhibit made at Madison Square, but also for its splendid pioneer work done in convincing the public of the great value of the electrical carriage propulsion. The company is now simply overwhelmed with orders, and a night shift is being worked.

Early after the opening of the show, President Cutter of the Cutter Electrical Manufacturing company of Philadelphia disappeared, but he turned up again in company with Mrs. Cutter during the convention, and both were warmly welcomed. Mrs. Cutter was one of the ladies who enjoyed the automobile ride on Wednesday, and also the steamboat trip Thursday.

R. B. Corey neglected his duty when he did not insist that Secretary and Treasurer Arthur Garrison of the Columbia Incandescent Lamp company of St. Louis should constitute the "moving portion" of the exhibit of the Columbia company. Mr. Garrison is, undoubtedly, a busy man, as his company is at present rushed with orders. But he will never be forgiven by his many friends for his failure to appear in New York at convention time.

Norman McCarty was constantly on hand and indefatigable in his work for Hugo Reisinger and the Diesel Motor company of America. Mr. McCarty is one of the oldest electrical salesmen in the field, and the Diesel company made a wise selection in choosing him to push its novel motor. No man in the field, it is safe to say, is better equipped to impress the power users as to the peculiar merits of what appears to be one of the greatest factors in the power-producing world.

The Keystone Electrical Instrument company of Philadelphia was represented by President J. F. Stevens, who came over on the opening day of the convention to do the honors for the Quaker City. Someone asked whether Stevens was a Quaker; but, up to date, no replies have been received. The company has recently gotten out a new instrument that is worthy the attention of all those desirous of an indicating device for current and voltage which may be located in a small space.

The Incandescent Electric Light Manipulator company, through the energetic efforts of the Messrs. Morse, gave a most entertaining exhibition on the second floor of the exposition, showing the merits of its manipulator. When one sees this tool for the first time, one cannot understand why such a thing has never been presented to lamp-users before. Messrs. Morse knew "a good thing" when they saw it, and they deserve credit for putting it into general use.

Secretary Thomas R. Mercin of the Northwestern Electrical association came down from Milwaukee, via Baltimore, where his daughter is visiting relatives of Admiral Schley. Mr. Mercin was most energetic in his work of increasing the membership of the Northwestern Electrical association. To his credit, it must not be forgotten that the Northwestern Electrical association is now able to

claim that as an association it embraces a larger number of members than even the National Electric Light association.

James Wolff, western sales agent of the New York Insulated Wire company; George Whyte of the Leschen-Macomber-Whyte company; William M. Smith, secretary and treasurer of the Chicago Insulated Wire company; W. W. Low, president of the Electric Appliance company of Chicago, and wife, formed a merry party, which took advantage of the convention and the electrical exhibition to visit New York. Mr. Wolff is an old New Yorker, and under his guidance the "tenderfoot" members were shown a few "new things."

Too much cannot be said in compliment of Manager Nathan's executive ability in handling the multitudinous details involved in so large an undertaking as the electrical show. Mr. Nathan was on hand daily and nightly; always polite, courteous, and looking to the interests of exhibitors, individually and collectively. For a number of years Mr. Nathan has held this delicate position, and filled it most successfully, winning for himself by his businesslike methods, not only the approbation of his associates, but also of the exhibitors.

If W. N. Matthews, manufacturers' agent, 312 Commercial building, St. Louis, hadn't been so exceedingly busy at home, he would have found the trip to New York a paying one, especially from the fact that Mr. Matthews is now offering a most attractive list of bargains, which he describes as being "good as new." Mr. Matthews has had wonderful success since his appearance in the field as a manufacturers' agent, no doubt due to his previous extensive experience as president of one of St. Louis' oldest and best electrical supply houses.

It was without doubt a great transformation, but the skillful manner in which Mr. Jefferson Wetzler demonstrated the beautiful phenomena of heating metal in a water bath by electricity in the booth of the Electrical Engineer Institute of Correspondence Instruction proved conclusively his fitness as the manager of an electrical correspondence school. Mr. Wetzler, as is well known, recently left the Electrical Engineer to join with his brother, Mr. Joseph Wetzler, in pushing their technical school, and he is making a great success of his new venture.

The American Impulse Wheel company of New York could not have done better than to have presented an exhibit of one of its wheels directly connected to a generator. This company is sending out a large number of wheels for mines and other electrical transmission plants. Its wheels are of high efficiency and are spoken of in the most complimentary manner wherever used. The company also manufactures small water motors for operating fans, printing presses and organs, and these motors are designed and built with the same care as the larger wheels.

One of the handsomest exhibits among the automobiles was that of the American Electric Vehicle company of Chicago, which was in charge of H. G. Osborn, engineer of the company, and C. B. Roulet. A "stanhope," a delivery wagon and a runabout buggy were shown. These vehicles have been in actual operation in Chicago for over a year. A very interesting circular was distributed, entitled "The Twentieth Century Movement." General Manager Corrigan of the company appeared during the latter part of the show and was warmly welcomed by his many friends.

The Manhattan Central Construction company seized the splendid opportunity to advertise extensively the Manhattan arc lamps. The simplicity of mechanism of this company's direct-current lamp is remarkable, as well as the unique trimming devices. The Manhattan General Construction company is meeting with great success with these lamps, and buyers will do well to secure the company's catalogue of the various styles of lamps it manufactures. President Marsh Young and Secretary Harris of the Manhattan company were on hand constantly during the convention.

The International Correspondence Schools of Scranton, Pa., made a very handsome exhibit. This institution gives a complete course by mail in electrical engineering, steam, mechanical, civil engineering, and, in fact, almost every known branch of technical work. The school was established in 1891, and the company claims on its rolls to-day as many as 45,000 students and graduates. The establishment at Scranton, with its magnificently organized equipment and course of instruction, is worth the study of anyone interested in the progress of technical education.

H. K. Gilman of the Western Electrical Supply company has not of late years been a frequenter of conventions, but this time the combined attractions of the electrical show, the national convention and a host of old friends in New York proved too much for him, and he was among the first arrivals from St. Louis. Mr. Gilman has, through his untiring efforts and businesslike policy, combined with his years of experience in the electrical business, brought the Western Electrical Supply company of St. Louis into an enviable position as one of the leading electrical supply houses of the great Southwest. Every year during the past few years has seen recorded a fine increase in the company's total business, and, at the present time, it is safe to say that

no western institution carries on its books a greater number of steady and wealthy customers and friends. The Western Electrical Supply company has recently been pushing the telephone branch of the supply business with remarkable success, and it may be stated that the company desires it known that it is in no "telephone combination or trust," but is attending strictly to its own growing business.

The Belknap Motor company of Portland, Me., took advantage of the electrical show to explain the merits of the Chapman voltage regulator for alternating or direct-current systems. This device insures steady lights in spite of changing speed and varying loads. It compensates for line loss and automatically keeps a constant voltage at any chosen center of distribution, however distant. The regulator is sent on 30 days' trial. The Belknap Motor company also manufactures water motors, woven-wire brushes, coffee mills, with electric and water-motor attachment.

It was a matter of regret that no one came East from the Central Electric company of Chicago. President George A. McKinlock was expected daily, as was also Secretary Charles Brown. The Central Electric company, however, is exceedingly busy at the present time, and the trade will be interested to know that it has recently secured the western agency of the high-grade machinery manufactured by the Bullock Electric Manufacturing company of Cincinnati. The Bullock company itself was represented at the show by Messrs. Bullock and Lozier, assisted by an efficient corps of lieutenants.

Of course R. Edwards, Jr., of Edwards & Co., New York, was on hand every moment of the time. Mr. Edwards, or, in army parlance, "Captain Edwards of the Eighth New York," is the man described by his friends as he "who fit and bled and did everything but die" at Chickamauga Park. Mr. Edwards did bring home with him a large amount of malaria, which he has never been able to shake off. Edwards & Co. issued a most attractive and comprehensive catalogue, which can be had for the asking; but, to quote Captain Edwards' own words, "if you don't send for it, you don't get it."

Where was Manager Kulp of the Marietta Manufacturing company of Marietta, Pa.? Mr. Kulp had intended to visit the electrical exhibition, but perhaps he was "lost in New York." The Marietta Manufacturing company is now so busy turning out the Kulp Crescent fans that he may have been detained in Marietta through pressure of business. It is said that 2,500 of these fans were recently shipped to St. Louis to the company's exclusive western agents, A. Riemann & Co. As a number of these fans will be kept in stock at 817 Market street, those having rush orders will know where to get a quick shipment of a Crescent fan.

Automobile companies were well represented, but none made a better showing than the Columbia Automobile company, whose exceptionally handsome display was in charge of J. M. Hill, manager of the company's New York office. It was interesting to note the care with which the vehicles were examined. Mr. Hill stated to a Western Electrician representative that he had to admit his surprise at the interest shown and the great number of orders booked. Manager Goodrich of the Hartford office of the company was also on hand during the exposition, and his courtesy to all interested in automobiles made many new friends for the Columbia company.

The popular New York manufacturers' agent, R. B. Corey, was, of course, on hand at all times, and, in company with H. B. Kirkland, did the honors for the American Circular Loom company of Chelsea, Mass. The company's exhibit consisted of samples of its electroduct in the form of a pyramidal coil of tubing, the largest sized duct beginning at the bottom, the coil gradually changing through smaller diameters as the apex of the pyramid is approached. The circular pyramid is about four feet high and stands on a square platform. At the back of the booth is displayed the trademark of the company, over which is an illuminated sign bearing the word "electroduct."

"Varley," of duplex-magnet fame, had given his solemn pledge to appear during the convention, and he may have done so; but his proverbial modesty, perhaps, kept him in the background. The Varley company is now enlarging its factory. Its business has expanded to a most remarkable extent, due, no doubt, to the phenomenal increase in the sale of telephonic apparatus of all sorts. The Varley company's special machinery for the production of its remarkable product, the duplex magnet, puts it in a position to command an enormous share of the trade in magnet coils in the United States. A magnifying glass used on a "duplex" coil reveals a most wonderful magnetic and electrical production.

Sterling arc lamps, manufactured by the Sterling Arc Lamp company of New York, as usual, made their mark. As is now quite generally known, the Sterling Arc Lamp company has placed its western agency in the hands of Messrs. Gates & Randolph of Chicago. Messrs. Gates & Randolph have warehouses in Chicago, where buyers are at all times furnished with facilities for testing the merits of the Sterling enclosed arc lamps for all circuits. Messrs. Gates & Randolph were missed at the convention. It had been hoped by Mr. Randolph's many New York friends particularly that he would remain over, but his new business ar-

range in Chicago necessitated his immediate procedure to that point.

Reflectors are now so extensively used in connection with electric lighting that the exhibit in charge of Frank Stout caught the eye of numerous visitors. The Frink window reflector, which is so extensively used in store windows, cluster reflectors and a general line of flat and cone shades was shown. A special feature of the exhibit was the ceiling light at the back of the booth. This light has a brass corona handsomely finished in polished brass, and is particularly suited for banks, offices and public buildings, stores and general use. It has a cluster of five lamps, at the center of which is a stalactite. Along the back of the booth were electric fixtures, the lamps of which are shaded by silk flowers, which gives a very pretty effect at night.

Machado & Roller of New York, general selling agents for the Whitney Electrical Instrument company, presented the Whitney glass-case switch-board machines for high-tension alternating current, extremely well adapted for high-tension work. The transformer type of alternating-current ammeter, also exhibited, whereby the heaviest current may be taken care of without difficulty and the instruments placed at any desired distance from the main buses without additional cost, is also of interest. Machado & Roller report that the dead-beat qualities of these goods resulted in making them favorites for electrolytic and other work where load fluctuations are so violent that the needle on the ordinary type of instruments would soon be broken.

From the attention that has been paid President Samuel Insull of the Chicago Edison company by the daily papers of recent date it is perfectly clear why he did not venture to visit the electrical show and participate in the gayeties of the National convention. Messrs. Ferguson and Holmes of the Chicago Edison company were in constant attendance at the meetings of the association. Mr. Ferguson, who has entire charge of the electrical engineering work of the Chicago Edison company, is looked upon as one of the brightest lights in the electrical engineering field. Mr. Holmes, of the supply department, found many old friends in New York, and was indefatigable in looking after the interests of the Chicago Edison company.

One of the most beautiful booths, among those arranged by the manufacturers of wires and cables, was that provided by General Manager Leonard F. Regua of the Safety Insulated Wire and Cable company of New York. Mr. Regua's designs for the electric-light effects, colors appearing and vanishing, and to tell the merits of Safety cables, attracted a great deal of attention. In fact, one could not pass this booth without reading the story of the "Safety seamless rubber-covered wire and cables." The Safety company recently made for the United States seamless rubber-covered wire and cables, Manila to the extent of 680 miles. The company is now manufacturing for the Metropolitan Street Railway company of New York over \$500,000 worth of rubber-covered and lead-encased feeder cable.

Gerald Hart, designer of the well-known Hart switches, took the opportunity to announce a new line of Diamond H push switches with pure mica insulation. Mr. Hart is the prime mover in the Hart Manufacturing company of Hartford, Conn. Up to a comparatively short time ago Mr. Hart was connected with the Hart & Hegeman company of Hartford, Conn., but he recently decided to organize a company of his own. It is Mr. Hart's purpose to make a number of improvements in switches, and produce a switch that is "right in every particular." In order to appreciate the new switches and fully understand what Mr. Hart means by pure mica insulation, one should possess a sample of this beautiful little mechanism. A mica washer of brushing of most ingenious construction has been introduced.

It is a matter of great regret that Manager Arthur Warren of the advertising department of the Westinghouse Electric and Manufacturing company of Pittsburgh could not have been on hand during the convention and exhibition. Mr. Warren had only returned recently from abroad in the interests of the Westinghouse company, and he was compelled, through pressure of urgent business, again to make a trip to Europe, where he is at the present time. Mr. Warren, in addition to handling the vast advertising interests of the several Westinghouse companies, does a great deal of special executive work. His extensive experience as a daily newspaper man has fitted him for his present responsible position, and, in addition to all this, he knows how to make friends for his company and hold them.

Where was General Manager Scoville of the Bossert Electrical Construction company of Utica, N. Y.? To be sure, Mr. Scoville was ably represented by R. B. Corey, but there were, nevertheless, many inquiries for the courteous president of the Bossert company. Mr. Corey made a display of the Bossert company's outlet, cut-out, switch, main-distribution and branch-circuit boxes, also steel panel boards lined with slate. These boxes are reinforced by malleable-iron legs, which also serve as a means of attaching the box to the wall. The Bossert company manufactures these boxes with the inside work complete, designed for any number or arrangement of circuits, with or without switches, and for either two or three-wire systems. These boxes are pro-

vided with plate-glass door set in a high, polished brass frame and fitted with lock and key.

The Dale company made an exhibit of a general line of fixture and operate, the most important feature being an arc lamp designed to burn on either alternating or direct current. This lamp is of the open-arc type and is known as Dale's pendant arc. It possesses the particular feature of economy, burning 100 hours on an average of 4 1/2 amperes and giving a brilliant and steady light of 1,200 candle power. It strikes the arc without pumping and burns at any angle, thus making it especially suitable for marine work. The lamp is claimed to be the simplest on the market, and has fewer parts than any. It weighs but 12 1/2 pounds and is 28 inches long. The company also displayed a complete line of desk portables, electric and combination chandeliers and brackets. The porcelain multiple receptacle requires no sockets, wiring, shade holder or insulating joint, and cannot be short-circuited. President J. H. Dale designed the booth.

John A. Roebbling's Sons company of Trenton, N. J., was, as usual, well represented. The exhibit included bare wires of all kinds in copper, from the largest trolley wire down to No. 36 gauge; office and magnet wires in great variety, electric-light cord, etc. The display included several 300-pound copper ingots, each of which contains enough material for 75 miles of No. 36 wire; samples of the latest Commercial cable, comprising the large shore ends, the intermediate sections and, finally, the deep-sea section. The conductor for this cable was furnished by the Roebbling company. An object of interest to railway men was the splice of the large three-phase cable for the Metropolitan Street Railway company. Another popular attraction was some pieces of the wire rigging of the steamer "Merimac," which was sunk by Hobson in Santiago harbor. R. M. Cockey, A. M. Whitaker, G. W. Swan and F. W. Harrington were constantly on hand, as was also Manager H. L. Shippy.

The Stanley Electric Manufacturing company of Pittsfield, Mass., has long since won an enviable reputation for its high-tension electrical apparatus, and its very interesting and complete exhibit of instruments attracted well-deserved attention. This display included the Stanley static voltmeters, static ground detectors, alternating and direct-current hot-wire ammeters and voltmeters, portable ammeters and voltmeters for both kinds of current, high-potential switches, lightning arresters, live cut-outs and fuse blocks, circuit breakers for alternating current and transformers. The latest types of these standard and well-known instruments are well displayed in a booth on the main aisle under charge of Mr. Barr. A special feature of the exhibit consisted in the new portable and station voltmeters. These instruments are compensated for all variations in temperature, are dead-beat and extremely accurate, being guaranteed to be within one-half of one per cent. in the portable type and within one per cent. in the station type. In addition to this they are capable of universal use, being adapted for service on direct or alternating currents of any frequency or wave form. Another good feature of these instruments is their flexibility.

Right down in the nest of automobiles, at the center of the main floor, was the handsome exhibit of the Woods Moto-vehicle company of Chicago, opening on four aisles, and containing several handsome automobiles. The leading features were the hansom cab with motor on the rear axle, the road-wagon with top, the stanhope, the brake, the park-trap and the coach-delivery wagon. The park-trap shown is that owned by Mr. Samuel Insull, in whose service in Chicago it has made over 8,000 miles. On these vehicles there are two independent motors for driving, dust and waterproof, with rawhide pinions. The front axle has steering knuckles and arms with ball bearings made to turn at an angle of 45 degrees. The running gear and axles are made of solid metal, and the wheels are rubber-tired with ball bearings. The brake is operated by the same lever that works the controller, and three speeds are obtained. The removal of a key from the reversing switch locks the vehicle when not in use. The batteries are sealed in hard-rubber cells. The running capacity is given at from 50 to 75 miles per day subject to charging facilities and duplication of battery. It was a matter of great regret that Designer Woods could not attend the show and convention, but I. H. Kuhl, who was in charge of the exhibit, did the honors in royal style.

Martin J. Insull of the General Incandescent Arc Light company of New York selected one of the most prominent locations for an exhibit in the garden. The moment one entered the building he was instantly confronted by the exceedingly handsome exhibit of this company, including goods made by the "G. I." company for itself and allied interests, such as the Wright Discount Meter company, the Paragon Fan and Motor company, the New York Electric Equipment company and the Chicago Rheostat company. A full line of direct-current and alternating-current arc lamps, plain type and interior or enclosed arcs for 110 and 220-volt circuits; standard knife switches, quick-break railway switches, new automatic knife switches, tablet and distribution boards, Paragon desk, bracket and ceiling fan motors, all of the 180 model; "G. I." incandescent lamp, Wright discount meters in operation, Hoyt discount meters in operation, Chicago Rheostat

company's rheostats, outlet boxes, flush receptacles; "G. I." flush switches, Molendo hooks and receptacles, and "G. I." underground apparatus (Tailleur patents) was shown. It will be seen that, excepting generating apparatus the exhibit covered a remarkably wide range of devices, appliances, fixtures and material. Mr. Insull was assisted by Messrs. Kruesie and Ritchie and other employes of Mr. Insull's several companies.

A device with merit, one that saves money for the purchaser, sells readily; and for this reason the McCay regulating socket for alternating incandescent lamps is meeting with a most flattering success at the New York Electrical Exhibition. This device, illustrated elsewhere in this issue, enables the consumer to raise and lower the light just as can be done with gas, and at the same time only use current in proportion to light obtained. Roughly speaking, the watts consumed can be reduced from, say, 50, down to five, thus lowering cost, according as the light is employed to a greater or less extent. The McCay Engineering company of Baltimore, which is manufacturing this socket, is one of the oldest and most experienced concerns in the Middle South engineering field. As an example of the high class of work done by the McCay company, it may be said that recent contracts undertaken are as follows: New Maryland penitentiary, 2,500 lights plant; Mount Royal pumping station, 500 lights; new Baltimore City College, 800 lights; Loyola College, 600 lights. The McCay company is also enlarging the electric-light and power plant of the Norfolk navy yard to the extent of an increase of the capacity of 6,000 lights; Crocker-Wheeler generators will be used. Incidentally it may be said that President H. Kent McCay of the company was formerly an officer in the United States navy, and resigned, as was the case with so many others, to enter the more promising electrical field.

Prindle Pump company of New York, hydraulic engineer and contractor for complete installation and centrifugal-pumping machinery, presented an exhibit conspicuous on account of the high lift to which one of the pumps is operating. A two-inch pump is discharging over 100 gallons per minute against a head of 60 feet, and is direct-connected to a $7\frac{1}{2}$ horse power Lundell motor. The company also had running a five-inch pump, direct-connected to a $7\frac{1}{2}$ horse power General Electric motor, and a six-inch pump, similarly driven by a horse power Westinghouse alternating-current inductor motor. These are designed for moderate lifts, and are suitable for a great variety of purposes, such as sewage disposal, irrigation, circulation for condensing and general factory service. The exhibit also included a vertical engine, direct-connected to a six-inch pump; also several belted pumps for dredging and other purposes. These pumps can be operated by any motive power, and can be depended upon for high efficiency at high as well as low lifts. Centrifugal pumps are especially adapted for use where large volumes of water are handled and where there is any solid or gritty matter suspended in the water to be pumped, as in sewage disposal or coffer-dam work. Among other large works, the Prindle company is just completing a pumping plant for the filtration of a portion of the water supply of the city of Albany, which is a model of its kind. The gentlemen in charge were Mr. Prindle and Electrical Engineer Arthur S. Ives.

The exhibit of the Wagner Electric Manufacturing company of St. Louis offered several attractions in specialties for the central-station managers who are trying to improve their day load. It comprised a $7\frac{1}{2}$ horse power 60-cycle 110-volt single-phase alternating-current motor, operating a six-kilowatt 110-volt direct-current generator. Current is taken from this generator through a switchboard on which are mounted direct-current voltmeters and ammeters and alternating-current ammeters and voltmeters, and indicating wattmeter for registering the current, which is supplied to an exhaust fan, electrically driven by a 110-volt motor. As evidence of the many uses to which the motors have been placed, a three horse power 60-cycle 110-volt single-phase motor is belted to a ventilating fan. The new type of switchboard instruments and the new switches which are about to be placed upon the market comprised another feature. As high-tension transmission transformers of large units and high potential are now in such demand for transmission of currents, reduction of ores, etc., the Wagner company presented a case of one of their high-tension transformers. A full line of standard lighting and motor transformer was also shown. A lot of well-illustrated views of 2,000 horse power transformers, the largest unit in the world, with photographs of switchboard and special-testing apparatus, proved interesting to visitors. The usual "Wagner corps" was on hand—Herbert A. Wagner and E. H. Abadie of St. Louis, John Mustard of Philadelphia, A. H. Maynard of New York and H. C. Buck of Boston.

One of the most interesting exhibits at the electrical fair to the scientist, the layman interested in scientific products, and the simple admirer of artistic display was the display of platinum and its application in the art made by Baker & Co. of Newark, N. J. A most perfect opportunity is given the visitor to observe the general uses made of this metal. In the small space of a few feet, artistically decorated in blue and white within a modest-sized show-case, an exhibit of many thousand dollars' worth of

platinum in the many forms given to it between the state of crude ore and the finished article of commerce. Samples of crude platinum sand and nuggets, from all parts of the world, including the largest nugget ever found in this hemisphere, are shown in an attractive form, together with many specimens of the associated metals of this group, such as iridium, palladium, rhodium, osmium, ruthenium and osmium. Grouped about these are many samples of the salts of these metals, exhibiting a beauty and variety of color and crystalline form. There are also many samples of platinum apparatus, such as are used by chemists, dentists, jewelers, electricians and incandescent-lamp manufacturers. Forming an interesting part of the exhibit are four cylindrical rods of pure gold, silver, platinum and aluminum of equal size, which are shown as illustrations of the relative weight and value of these metals. From the card attached it is seen that the gold weighs 10.19 ounces and is worth \$210; the silver 5.55 ounces, and \$3.50; the platinum 11.34 ounces, and \$196, and the aluminum 1.37 ounces, and nine cents. If one lifts first the platinum rod and then the aluminum, the difference in weight is almost startling. The walls of the booth are adorned with fine illustrations of the photographic art upon platinum paper. Taken all in all, this exhibit appeals strongly to the lover of artistic display and the seeker after knowledge.

The Cling-surface Manufacturing company of Buffalo, N. Y., was represented by Manager Albert B. Young and his electrical engineer, Mr. Foster. The company claimed that an average of 40 per cent. more power can be transmitted by a belt treated with cling-surface than with one not so treated. This is done by means of machines arranged in the following manner: A direct-current $7\frac{1}{2}$ horse power 110-volt motor, running at 750 revolutions per minute, drives, by means of two four-inch belts on its one pulley, two $\frac{3}{4}$ -kilowatt 125-volt multipolar dynamos, each running at 1,000 revolutions per minute. Thus the two dynamos, being of the same capacity and deriving their power from the same source, enable a comparison of the performance of the two belts, which are of the same size, and made from the same piece of leather. The tension on the belts is obtained by means of heavy spring scales, pulling at the back of the machines. The belt treated with cling-surface has a tension of 115 pounds, while that without cling-surface pulls on its machine with a tension of 200 pounds. The cling-surface belt runs slack, while the other one runs tight, and the slackness of the former belt may be varied within a considerable range with but little effect on the lamps. A similar variation in the tension on the tight belt, however, produces a marked change in the light. Tests are made to show that there is no slip on the cling-surface belt, while on the other there is constant slippage. It is claimed that belts treated with cling-surface do not slip, and that they will transmit power up to their breaking limit. In this exhibit the loose belt does twice the work of the tight belt, thus demonstrating the advantage to be gained by the use of cling-surface. The load on the machines consists of two lamp signs at the back of the booth, reading: "Without Cling-Surface" and "With Cling-Surface." These two signs enable a comparison of the results of using treated and untreated belts. A belt treated with cling-surface clings to the belted surface of the pulley rather than sticks to it in much the same way as a moist hand clings, but does not stick.

CORRESPONDENCE.

New York Notes.

New York, May 22.—Governor Roosevelt has called a special session of the Legislature to amend the Ford franchise-tax bill. It will meet to-day. The governor will probably suggest that the making of assessments on franchises be left with the state authorities rather than vested in local boards. Thus equity between franchises in different localities in the state will be preserved. The governor is also in favor of a provision that from the new franchise tax there shall be deducted the tax as now paid by the corporation.

Export night brought together at the electrical show in Madison Square Garden a large number of consular representatives of foreign countries and manufacturers. Shortly after nine o'clock the visitors were escorted through the exhibition by a committee of the exhibitors of which H. L. Shippy was chairman. Many new inventions intended for the foreign market were displayed. Nearly all the European and South American countries were represented by consuls in the party.

Mayor Van Wyck says that he expects to see a rapid-transit tunnel started during his term of office. Labor people are demanding that the city build the tunnel under existing law. Other tunnel schemes are coming up in addition to the north-and-south proposition for the borough of Manhattan that has been under consideration for years. The Manhattan Tunnel Railway company was incorporated on Wednesday in Albany with a capital of \$10,000, which may be increased to an unlimited amount. The corporation, it is stated, is to construct a sub-surface or tunnel railroad of standard gauge for the transportation of passengers and freight. The road is to have one terminus "on the

west side of the borough of Manhattan somewhere below Canal street." From there it will be run through an underground tunnel to the shore line of the Hudson River, going thence by tunnel under the Hudson to some terminus in Jersey City. The directors are Frederick Martin Lande, Charles S. Bradley, William E. Knight, Arthur P. Knight, William A. Courtland, John P. Laffin and David J. Newland of New York city, James V. Hulse of Brooklyn and Philip W. Hall of Cranford, N. J. Another plan is that of the New York and Brooklyn Railroad company, of which Emerson McMillin is president. This company proposes to build a tunnel under the East River from Park row and Ann street to Willoughby and Adams streets, Brooklyn. In addition to Mr. McMillin, the directors of the company are Silas B. Dutcher, Philip Lehman, Isidor Wormser, Jr., Frederick B. Esler and Henry M. Hutchinson. The secretary of the company, which was incorporated in 1896 and now has a resolution to perfect its franchise rights pending in the Municipal Assembly, is D. F. Bouthirt.

The work of equipping the Coney Island branch of the Brooklyn Rapid Transit company's elevated road with electric power is being pushed along rapidly, and although it was intended to operate the line by electricity on Decoration Day, this has been found to be impossible. It is said at the company's offices, however, that the new power will be in use by June 9th.

It is reported that the Third Avenue Railroad company will soon issue about \$20,000,000 additional stock to raise money to pay for the electrical equipment and for other purposes.

Twelve air-power cars for cross-town street-car service on the Metropolitan lines have been fitted up and are running on Twenty-third street at night. Each car is said to weigh 17,200 pounds. The air-compressing plant is at the company's shops at Twenty-fourth street and Eleventh avenue. The new cars are intended for use on the Twenty-eighth and Twenty-ninth street cross-town line, but until the tracks of that line are considerably strengthened the cars will not be set at their regular work there. M. S.

PERSONAL.

Marconi was entertained at dinner by John Henninger Heaton, M. P. for Canterbury, in the dining rooms of the House of Commons, on May 9th.

Dr. S. P. Langley of the Smithsonian Institution and Professor A. A. Michelson of the University of Chicago were elected honorary members of the Royal Institution of Great Britain at the distribution of honors in commemoration of the centenary of the institution.

Dr. J. M. Scott of Philadelphia, who is interested in William Morrison's new electro-mechanical system of vehicle propulsion, was in Chicago early in the week. Dr. Scott is extending his western trip to Colorado and Mexico, and will return East by way of Chicago in a few weeks.

Mr. Frank G. Bolles has accepted the management of the advertising department of the Bullock Electric Manufacturing company of Cincinnati. Mr. Bolles is a capable and experienced man in his department. He was for some time connected with the advertising bureau of the Westinghouse companies.

Mr. E. E. Keller, the vice-president and general manager of the Westinghouse Machine company of Pittsburg, was a Chicago visitor early in the week. Mr. Keller says that the volume of business in the Westinghouse shops is very large, and that the prospects of a good trade, both domestic and foreign, for some time to come, are excellent.

Albert Lynn Lawrence, after an association of several years with the patent-law firm of Barton & Brown, Chicago, announces that he has taken offices for the practice of law at 1445 Monadnock building, Chicago, devoting himself particularly to patent, trade-mark and copyright litigation and to the soliciting of United States and foreign patents.

Messrs. J. J. Wood and F. S. Hunting of the Fort Wayne Electric Works were in Chicago on Saturday and Sunday last, conferring with Mr. Charles Munson, the Chicago manager. They are confident that the business of the Fort Wayne factory has a great future. Plenty of orders are now on hand; a full force of men is employed, and all hands are imbued with energy and enthusiasm.

Announcement is made of the marriage of Mr. Samuel Insull of Chicago and Miss Margaret Anna Bird at the residence of the bride's mother in New York on May 23d. The Rev. James Millard Phillpott, pastor of the Lenox Avenue Union Church of the Disciples of Christ, officiated. It is understood that Mr. and Mrs. Insull will make a wedding journey to Europe, returning finally to Chicago, where they will live. The engagement of Mr. Insull and Miss Bird was announced last week, and Mr. Insull was overwhelmed with congratulations by his Chicago friends.

Henry L. Doherty, the president of the Northwestern Electrical association, is nothing if not versatile. It seems that he is now projecting his scientific thought along the line of experiments with the X-ray to kill disease germs, collaborating therein with a Milwaukee physician. The fact came out in

a brief interview that a reporter for the New York Tribune secured from Dr. Doherty during the convention of the electric-light men.

Professor Alfred E. Phillips of Columbia City, Ind., has been selected as the head of the new department of civil engineering in the Armour Institute of Chicago, of which he will take charge in September. Professor Phillips is a graduate of Union College, Schenectady, N. Y., where he took the degree of Ph. D. He afterward filled the chair of civil engineering in Purdue University, and was professor of hydraulic and bridge engineering in the University of Wisconsin.

Professor Thomas C. Roney, dean of the faculty of the Armour Institute of Technology of Chicago, died on May 20th. He was a graduate of the old Chicago University and a well-known instructor. Professor Roney was born in New Jersey in 1856. In 1883 he was married at Burlington, Ia., to Miss Sadie Newman, daughter of Judge T. W. Newman. His wife and three children survive him, also four brothers. These are William R. Roney of the firm of Westinghouse, Church, Kerr & Co., Pittsburgh Pa.; Charles J. Roney, former secretary of the Western Society of Engineers; Frank B. Roney of Denver, and Professor Henry B. Roney, the Chicago organist and concert manager.

A correspondent of the London Chronicle is reminded of an incident connected with the life of Faraday that has not, he believes, yet appeared in print. Lord Melbourne once announced to Faraday that it was his pleasing duty to offer him a pension, but, he added, "I suppose all this science is humbug." Faraday at once replied: "If that is your opinion, my lord, I decline the pension," and retired. Melbourne, on meeting some of his colleagues, said: "I have had a strange thing happen; a man has declined a pension." But these gentlemen knew Faraday's position and reputation better than the premier, and urged him to rectify the blunder. Faraday was again interviewed, but Melbourne was obliged to retract and apologize before the pension was accepted.

ELECTRIC RAILWAYS.

H. F. Atwood, secretary of the Rochester German Insurance company, has been appointed receiver of the Rochester and Irondequoit Railway company. The application was made by the Rochester Trust and Safe Deposit company to foreclose a \$500,000 mortgage given by that company to secure the payment of 5 per cent. bonds, in which default of interest has been made since April, 1898. The company owned a steam and trolley road, which was leased in April, 1898, for 10 years to the Rochester Railway company.

ELECTRIC VEHICLES.

And still they come! The Electric Automobile and Manufacturing company, with an authorized capital of \$500,000, was incorporated in New Jersey on May 17th. The company is empowered to manufacture and operate vehicles propelled by electricity or other power. The incorporators are Charles P. Scott of New York and Frederick W. Gaston and Edgar J. Runyon of Elizabeth.

Companies desiring to operate horseless-carriage lines for hire on the park boulevards of Chicago have a hard time. The South Park commissioners have refused to sanction such projects, and now automobile lines have been barred from the West Side boulevards and parks by the West Park commissioners. The Suburban Electric Carriage company offered to pay two per cent. of the profits for permission to run a line of automobiles from downtown to Garfield Park by way of the boulevards and another making the circuit of the parks. The proposition was rejected.

General Greely, chief signal officer of the United States army, has invited proposals for furnishing the army with three electric carriages, with which some interesting experiments will be conducted near Washington. It is General Greely's idea that the vehicles can be used for paying out a wire and promptly connecting two points between which communication is desired. At present it is necessary to load instruments into a wagon or on a horse and send them to their destination. This experiment is said to be one of a number that will be made to ascertain to what uses a horseless carriage can be put by the Signal Service.

Seventeen electric-vehicle transportation companies were incorporated in New Jersey on May 19th. These companies were formed by the Whitney-Elkins-Widener syndicate to operate automobiles in different states. Each concern has an authorized capital of \$100,000, except the one formed for the District of Columbia, which has an authorized capital of \$6,000,000. Except in this latter case, the amount of capital named in the certificate is nominal, and will probably be increased later. The incorporators in each case are James E. Hayes, a Jersey City lawyer, and clerks in his office. The states for which these companies are formed are Tennessee, Georgia, Ohio, Kentucky, New Jersey, Louisiana, Delaware, California, Michigan, Minnesota, Iowa, Maryland, Wisconsin, Indiana, Missouri, Virginia and the District of Columbia. A member of the parent organization said that a company would be planted in every state and territory of the Union, and that ultimately the

enterprise would be extended to Canada, Mexico, Cuba, South America and Europe.

INDUSTRIAL COMBINATIONS.

It was announced authoritatively in Boston last week that the consolidation of 33 electric street railways and electric-light companies in Massachusetts and Rhode Island will be made on June 1st. The company will be known as the Massachusetts Electric company. The concern will be a voluntary association, it is said, and will not be incorporated. The capitalization will be not less than \$24,000,000, one-half 4 per cent. cumulative preferred stock and one-half common. The stock of the new company will shortly be offered for public subscription at 105 for the preferred stock, each share of which will carry one-half share of common stock as a bonus. The stock has been underwritten. The new stock will be exempt from taxation in Massachusetts. The following is a list of the names of the companies which will be taken over: Lowell, Lawrence and Haverhill; Reading and Lowell, Lowell and Suburban, Rockport street railways, Nashua street railway, Gloucester street railway, Gloucester and Rockport, Gloucester, Essex and Beverly; Lynn and Boston, Milton and Brockton; Braintree street railways, Wakefield and Stoneham, Woburn street railways, West Roxbury and Roslindale and Needham and Boston, Norfolk Central, Norfolk Suburban, Boston, Milton and Brockton; Brockton street railway, Brockton and East Bridgewater, Brockton Bridgewater and Taunton; Quincy and Boston, Taunton street railways, Dighton, Somerset and Swansea; Providence and Taunton, Globe street railway (Fall River), Newport and Fall River, Newport street railway, Newport Illuminating company, Hyde Park Electric Light company.

PUBLICATIONS.

The Vindex Electric company of Chicago issues a neat little catalogue, in green and black, showing its '99 type of transformer. The instruments are carefully described and illustrated. Technical data and prices are given, and the closing pages are devoted to testimonials.

The front cover of the new catalogue of the Fischer Equipment company of Chicago shows a string of electric cabs and carriages, and the brochure bears the appropriate title, "In the Line of Progress." The catalogue is very handsomely illustrated and gives the desired information about the Woods motor-vehicles in compact form. A noteworthy feature is the large variety of electric carriages and wagons shown. One statement, relating to the capacity of the factory, contains an allusion of curious interest: "Our facilities for both regular and specialized work are large, and are being rapidly increased by the demand, though our plant has not yet attained the dimensions of that foreign factory in our line, where a recent suit for working overtime brought out the fact that they employ 100,000 hands!"

Circular No. 50 of the Electric Storage Battery company of Philadelphia describes the installation of accumulators in the Criminal Court building, New York. The generators in this plant run from 10 to 12 hours each day, during which time their load is practically uniform. This result is due to the fact that the battery is charging during these hours at a rate inversely proportional to the lighting load which the system is carrying at the same time. Usually, this uniform load is just sufficient for one generator, thus insuring a maximum efficiency of the plant, and in event of a temporary overload, the battery can be discharged in parallel with the generator to assist it over the peak. During the remainder of the 24 hours the battery carries the entire load, effecting a considerable saving in the labor and fuel accounts and acting as a reserve in case of accident to the steam or generating plant.

MISCELLANEOUS.

The Treasury Department has instructed the collector of customs at New York, that, on the exportation of electric-elevator engines complete, manufactured by the Otis Elevator company of New York, the motors of which are imported, and the winding machinery and bedplates or other parts required to make a complete mechanism are of domestic manufacture, a drawback will be allowed equal in amount to the duty paid on the imported motors so used, less the legal deduction of one per cent.

Within the last week or so electrical storms have been reported from all parts of the Atlantic coast and middle western states. A Baltimore dispatch of May 18th says: "Maryland from the mountains to the sea has been swept the last 48 hours by terrific rain, hail and electrical storms. Telephone service, trolley wires, cables and other electrical apparatus have been damaged by the unusually severe disturbances. Four persons and a considerable number of cows and horses have been killed by lightning, and a dozen or more people severely shocked." Deaths, casualties and fires are also reported from lightning in other localities.

A recent Boston dispatch says: "The Boston Elevated Railroad company has just received a consignment of 300 tons of steel guard rails from London, to be used on its new structure. General Ran-

croft, the general manager of the company, said that he had made every effort to place the order with some American firm, but that when he went into the market he found that competition in the particular rails (which are used as curves and weigh about 160 pounds to the yard) had been estimated and that he would have to pay the price established by the trust producing them if he was to use American-made rail. The price he considered exorbitant and he invited quotations from English sources. As a result the contract was given to Dick, Kerr & Co. of London at a price considerably under that made by the domestic mills, and which, when the rail being landed here duty paid at a rate of perhaps 25 per cent. over the price asked by the domestic concerns."

TRADE NEWS.

The New England Zinc company, with an authorized capital of \$1,000,000, filed articles of incorporation at Trenton, N. J. on May 19th.

The city clerk of Falls City, Nebraska will receive bids, until June 12th, for the equipment necessary for the proposed lighting plant for that town.

On Saturdays, from May 1st to the last of October, the Western Electric company, Chicago, closes its shipping room, store and factory at noon, and its offices at one o'clock.

The Central Electric company, Chicago, is exceedingly gratified with the results of its agency for the Bullock generators and motors. The applicability and reliability of the Bullock motors in driving printing presses is shown by both commendation and inquiry.

The Perret Storage Battery company of New York, with capital of \$100,000, was incorporated in New York state on May 20th. The directors are Frank A. Perret and Robert R. Clayton of Brooklyn, Omri F. Hibbard, J. Lester Kornicker and Walter I. McCoy of New York.

William M. Porter, manufacturers' agent, 708 Hammond building, Detroit, is handling the dynamos and motors of the Northern Electrical Manufacturing company of Madison, Wis., and will also sell electric vehicles. He will be glad to hear from manufacturers of good electrical specialties who wish representation in Northern Ohio and Michigan.

The J. B. McKeague company, 34 Dearborn street, Chicago, is the western representative for William T. Pringle of Philadelphia, manufacturer of switchboards, panel-boards, fuse panels, switches and flush receptacles. Mr. Pringle has just placed on the market a "new style" receptacle and attachment plug for which exceptional claims are made.

A finely executed steel engraving of General Grant was sent out by the American Electrical Works of Providence as a souvenir of Memorial Day, together with a brief statement of the principal events in the remarkable career of the great soldier of the War of the Rebellion. It is a very appropriate souvenir, and aside from its artistic merit will be gratefully received by the admirers of General Grant.

Canfield & Co. of Columbus, O., have entered into the electrical construction business, covering the territory of Ohio, erecting and selling electrical apparatus, both private and municipal. They desire to correspond with different manufacturers of electric specialties to be represented in the territory named. Mr. H. L. Canfield has been doing business in the construction line in this territory for the last 14 years.

George W. Patterson, 1530 Marquette building, Chicago, is desirous of securing a number of the most interesting electrical devices to exhibit at the entertainments he is giving in and about Chicago. "I can exhibit small articles of practical utility or novel use," says Mr. Patterson, "to the best possible advantage to great numbers of people who never go to an electrical supply house, and yet would buy if they knew what there was on the market."

The Walworth and Neville Manufacturing company of Bay City, Mich., has established at Beaumont, Texas, a factory for the manufacture of cross-arms for telephone and telegraph poles. The plant will begin operations in a short time. A contract has been closed with the Texas Iron and Lumber company of Beaumont for 3,000,000 feet of material for this year, much of which will be crosscut. This firm has another factory of this kind at Norfolk, Va.

The B. F. Sturtevant company, whose well-known "chimneyless" factory is situated at Jamaica Plain near Boston, is making an addition to its already large floor space for electrical work. Another story is being added to two of its shops, one 125 feet by 50 feet and the other 100 feet square, both of which will be used for this purpose. The increase in the business of this department has been large. The company is now making electric motors up to 125 horse power and generators up to 100 kilowatts.

A Riemann & Co., 824 Market street, St. Louis, formerly the A. C. Wolfram Electric company, electrical contractors and tin jobbers, have been in the tin business for 10 years, and are the sole western agents for the Maricotta Manufacturing company.

manufacturer of the well-known Crescent fan. The wide experience of Riemann & Co. enables them to secure their share of the fan business in the West. The firm reports that it is doing its utmost to keep up with its orders, and that its fans are giving the utmost satisfaction.

The Navy Department, through the Bureau of Supplies and Accounts, is inviting sealed proposals until May 31, 1899, for furnishing the New York navy yard with the following-named electrical supplies: Forty-eight thousand five hundred feet single and double conductor wire of navy standard, three testing generators (50,000 ohms), three portable direct-reading voltmeters, 24 knife switches, eight knife switches, two two-point ground-detector indicators, three engine indicators, three hand tachometers, three hand speed indicators, three sets of fuses for dynamo switchboard, three enameled rheostats, 544 16 candle power lamps, 36 32 candle power lamps, three waste tanks with covers, brass rod for switchboard and switch receptacles, ceiling fixtures, portables and steam-light globes. Intending bidders desiring specifications and blank forms of proposals can obtain them upon application to the bureau at Washington, D. C., or the Navy Pay Office at New York.

The Phoenix Battery Manufacturing company of St. Louis was recently organized, with a paid-up capital of \$250,000. Heretofore this company was known as the Phoenix Carbon Manufacturing company, which sold out its electric-light, carbon and motor-brush departments. The Phoenix Battery Manufacturing company is now giving its attention exclusively to the manufacture of batteries and carbon specialties. The company has just purchased an eight-acre tract of land in St. Louis, and will build and equip one of the largest plants of its kind in the world, which will enable it to do business on the largest scale. Colonel S. G. Booker, the well-known superintendent of the old Phoenix company, will still remain in charge. He is one of the oldest carbon men in the United States, and is known as one of the most active men in the business. It is confidently predicted that he will be as successful with the new Phoenix company as he was with the old.

The Bullock Electric Manufacturing company of Cincinnati will ship to England, about June 1st, one 25 horse power generator and two 30 horse power, one 40 horse power and two 50 horse power printing-press equipments for the Manchester Sporting Chronicle. One 25 horse power type C printing-press motor, with controller, will go to Cassell & Co., London, who are said to have the largest publishing house in England. A slow-speed motor for direct connection to lithograph press, with controller, will be forwarded to the Belfast Evening News, which will also take a 30 horse power printing-press equipment, with teaser and controller. Two 50 horse power motors, with teasers and controllers, will be dispatched to the London Daily News. These "teaser" equipments are intended to drive large newspaper presses. These shipments will be the most important consignments of electrical machinery that have ever been made from this country to newspaper establishments on the other

side. Other English orders, which will be executed soon, include a small motor for the Machinery Trust, Limited, of Chester; two 40 horse power slow-speed generators for the Thornycroft ship-building yards, one slow-speed motor of five horse power, to be supplied to Richard Moreland & Co. of London, and one four horse power motor for Charles Churchill & Co. of Birmingham. These orders represent about \$20,000. Smaller shipments are stated to have been made this month to other foreign countries.

BUSINESS.

Ball engines for electrical service have been recently sold by the Ball Engine company of Erie, Pa., for the St. Joseph Hospital, Philadelphia; Cleveland Rolling Mills, Cleveland, O.; Marion Electric Light company, Marion, O., and E. R. Behrend & Co.'s paper mills, Erie, Pa.

The Emerson Electric Manufacturing company of St. Louis says: "We have not advanced desk-fan prices. We are still quoting desk and bracket fans at the prices named in our schedule of March 1st, which was sent with fan-motor catalogue, and we shall not advance prices on desk fans unless absolutely forced to do so."

Mr. Thomas Burns, No. 5000 Halsted street, Chicago, has ordered one 60-kilowatt Western Electric generator installed in his building for light and power purposes. The work of installation is being done by the construction department of the Western Electric company. The Kroeschell Bros. Ice Machinery company, Chicago, has installed a 15 horse power Western Electric motor in its factory.

As an indication of the progressiveness of the Swarts Metal Refining company of Chicago it is stated that the company has just purchased 100,000 pounds of scrap copper wire from Cuba. The company pays the highest prices for old copper wire and other scrap metals, and those who desire to realize on these materials may find it to their advantage to communicate with the Swarts company.

The Victor Electric company, Chicago, manufacturer of fan motors, small electric motors and other electrical specialties, is now prepared to furnish small sparking dynamos for gas-engine work. The company states that it has been working on these machines for some time, and now has a number of them doing most satisfactory work. The Victor company takes pride in turning out only the finest work.

That the Whitney Electrical Instrument company is meeting the requirements of the trade in the line of electrical testing instruments is shown by its latest catalogue, which is a most complete list of electrical testing instruments. The Whitney instrument has established a reputation as a medium-priced, high-grade instrument. The Electric Appliance company, the general western agent, is prepared to supply new catalogues promptly on application.

The white-clay tubes as supplied to the trade by the Central Electric company, Chicago, are giving good satisfaction. The tubes, being straight, well vitrified and free from blemishes, are easily in-

stalled and produce lasting results. Prompt shipments come from good stocks, and the Central Electric company carries all standard sizes, but states that the five-sixteenth by three-inch size, with nine-sixteenths-inch outside diameter, is sold much more largely than any other.

Charles H. Besly & Co., 10 and 12 North Canal street, Chicago, carry a complete stock of the celebrated Pecora machinery paints, which have been on the market and have given excellent satisfaction since 1862. The flat steel color is in paste form for engines, tools and general machinery. The egg-shell gloss enamel finishing paint for engines, tools and general machinery is said to be dustproof in 10 minutes and to dry hard in 30 minutes. It is sold only in liquid form. The Dresden machine enamel imparts a rich, glossy appearance for radiators, gas engines, etc. The iron filler is used for making rough castings smooth, and the Pecora blow-hole cement is something new. This is claimed to be the one cement which will stand under the planer, lathe, file and other finishing operations. It comes dry and is worked with a knife. It stands 200 degrees heat and is gas and air-tight. A sample is sent free. C. H. Besly & Co.'s new May, 1899, catalogue is now ready for distribution. It is mailed free to any address on application.

Among the buildings which are now being wired for central-station service from the Chicago Edison company's plants may be mentioned these: The new fireproof factory for Bauer & Black, Twenty-fifth street and Armour avenue (in this building are installed about 30 motors, aggregating over 100 horse power, 43 constant-potential arcs and over 100 incandescents); new building erected by Frederick Ayer on Wabash avenue and since occupied by A. C. McClurg & Co. (150 arc lamps and 250 incandescent lamps, together with four electric elevators and two pumps); new block of buildings on the Lake Front, now in process of construction by Stanley McCormick (200 arc lamps and 156 incandescents, also eight electric elevators); at the southeast corner of Wabash avenue and Jackson street the old building is to be torn down to make room for the new Cable building, which will be wired for 29 arc lamps, 540 incandescent lamps, three electric elevators and two pumps; Michael Reese Hospital, Lake Front and Twenty-ninth street, 450 incandescent lamps and 16 horse power in motors; Lakeside building, southwest corner of Clark and Adams streets, which has just been remodeled (rewiring of the building in iron-armored conduit for 25 arcs and 300 incandescents and electric elevators); new building for the Western Methodist Book Concern now in process of construction at 57 Washington street (over 100 horse power in motors and 1,100 incandescent lamps); Merchants' Loan and Trust building, corner of Adams and Clark streets (capacity of upwards of 4,000 16 candle power lights and over 200 horse power of elevators and miscellaneous power); the new fireproof warehouse on Polk street (about 300 incandescents and four electric elevators); Hub clothing establishment's new addition at State and Quincy streets (about 1,200 lights); Marshall Field's wholesale building, Adams street and Fifth avenue (about 2,000 incandescent lamps).

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued May 16, 1899.

624,604. Electrical Switch Apparatus. William F. Bossert, Utica, N. Y. Application filed October 15, 1898.

A main conductor is formed integral and has its ends bent downwardly and secured to the base, that portion intermediate the downwardly bent ends being separated from the base by an interspace, and a branch conductor formed integral is passed through the interspace and has an upwardly projecting portion engaging the main conductor.

624,614. Trolley. Edwin Duty, Jr., Cleveland, O. Application filed February 10, 1898.

The trolley wheel has a lateral extension, and an insulated shoe is secured intermediately of the extension and the wheel periphery.

624,671. Electric Motor-starting Switch. Edwin H. Porter, Fort Wayne, Ind. Application filed January 19, 1899.

In an electric motor-starting rheostat switch two levers are employed, one carrying an operating handle and the other carrying the contact pieces for the rheostat, the levers being locked together, and electromagnets are adapted to lock and unlock the levers from each other.

624,676. Continuous-current Shunt Machine. Adolf Singer, Darmstadt, Germany. Application filed November 11, 1898.

In a shunt dynamo or shunt motor the connection of one end of the shunt with a point of the main line and the other end of the shunt with a fixed point of the armature winding.

624,699. Electric Motor. Hans O. Swoboda, New York, N. Y. Application filed November 15, 1897.

Current made for an expandable strip, a shaft with which the expandable strip is connected, a lever mounted on the shaft, a device acting to rotate the shaft and a solenoid mounted on the shaft.

624,699. Apparatus for Electrically Igniting Miners' Safety Lamps. William Best, Morley, England. Application filed December 23, 1897.

This device has a wick carried on a tube secured to the lamp bottom, and an adjustable wick tube combination with a central conductor insulated from the lamp bottom by an insulating material

carrying a cap together with a suitable apparatus for passing the current from the cap across the wick to the wick tube.

625,015. Battery Solution. Henry Blumenberg, Jr., New York, N. Y. Application filed September 17, 1898.

The battery solution described consists of a chlorate of an alkali metal or alkali-earth metal and a bisulphate of an alkali metal or alkali-earth metal in approximately equal proportions and mixed with water.

625,049. Illuminative Advertising and Decorative Apparatus. Timpron P. Martin, Liverpool, England. Application filed June 17, 1898.

In illuminative advertising and decorative apparatus there is the combination of the rotative cylinders with projecting changeable and adjustable studs thereon; a movable letter bar in the same plane as each of the rings of the stud holes in the cylinder; means for moving the letter bar and a series of conductors lying at right angles to the letter bars, the bars and conductors being in electric circuits in which electric lamps are disposed.

625,060. Apparatus for Controlling Movements of Electric Elevator Cars. Gustaf Rennerfeld, New York, N. Y. Application filed January 29, 1898.

An electric motor is provided with electromagnetic means for automatically closing the circuit through the field-magnet coils before it is closed through the armature coils. Additional electromagnetic means are provided for effecting such closure of the circuit through the armature coils.

625,080. Apparatus for Cleaning Hulls of Vessels. James S. Zerbe, New York, N. Y. Application filed August 26, 1898.

A hull cleaner is composed of a cylindrical shell having motors within and projecting shafts connected to the motors and carrying brushes on the outside of the shell, and lever-operated shafts carrying casters at their outer ends, projecting from the shell intermediate the brush-carrying shafts and adapted to be operated from within the shell for the purpose of bringing the brushes into and out of contact with the hull.

625,098. Electrical Distribution by Storage Batteries. Justus B. Entz, Philadelphia, Pa. Application filed February 1, 1899.

In a system of electrical distribution by storage batteries the combination with a booster interposed in a

battery conductor, of a practically constantly excited field coil for the booster and two series field coils, opposed to the coil and respectively interposed in a working conductor on the generator and service sides of its union with the battery conductor.

625,099. Electrical Distribution by Storage Batteries. Justus B. Entz, Philadelphia, Pa. Application filed February 3, 1899.

The combination in a system of electrical distribution by means of storage batteries of a compound-wound generator, a storage battery of small voltage in parallel with the series field of the generator and a booster and storage battery in multiple with the leads or working conductors.

625,100. System of Electrical Distribution. Justus B. Entz, Philadelphia, Pa. Application filed February 6, 1899.

Means are provided for causing a practically constant rate of current to flow over circuits between which there is a varying difference in voltage, which comprise a dynamo interposed between the circuits and having a constantly excited field and a series field oppositely it.

625,133. Flash-light Apparatus. Simon D. Alter and Lewis T. Young, Philadelphia, Pa. Application filed December 21, 1898.

A flash-light cartridge consisting of a box or casing containing a mass of flash powder, and having embedded in the latter an electric igniting device covered by insulating material susceptible of being inflamed by the passage of the current through the igniter, and serving when thus inflamed to fire the flash powder.

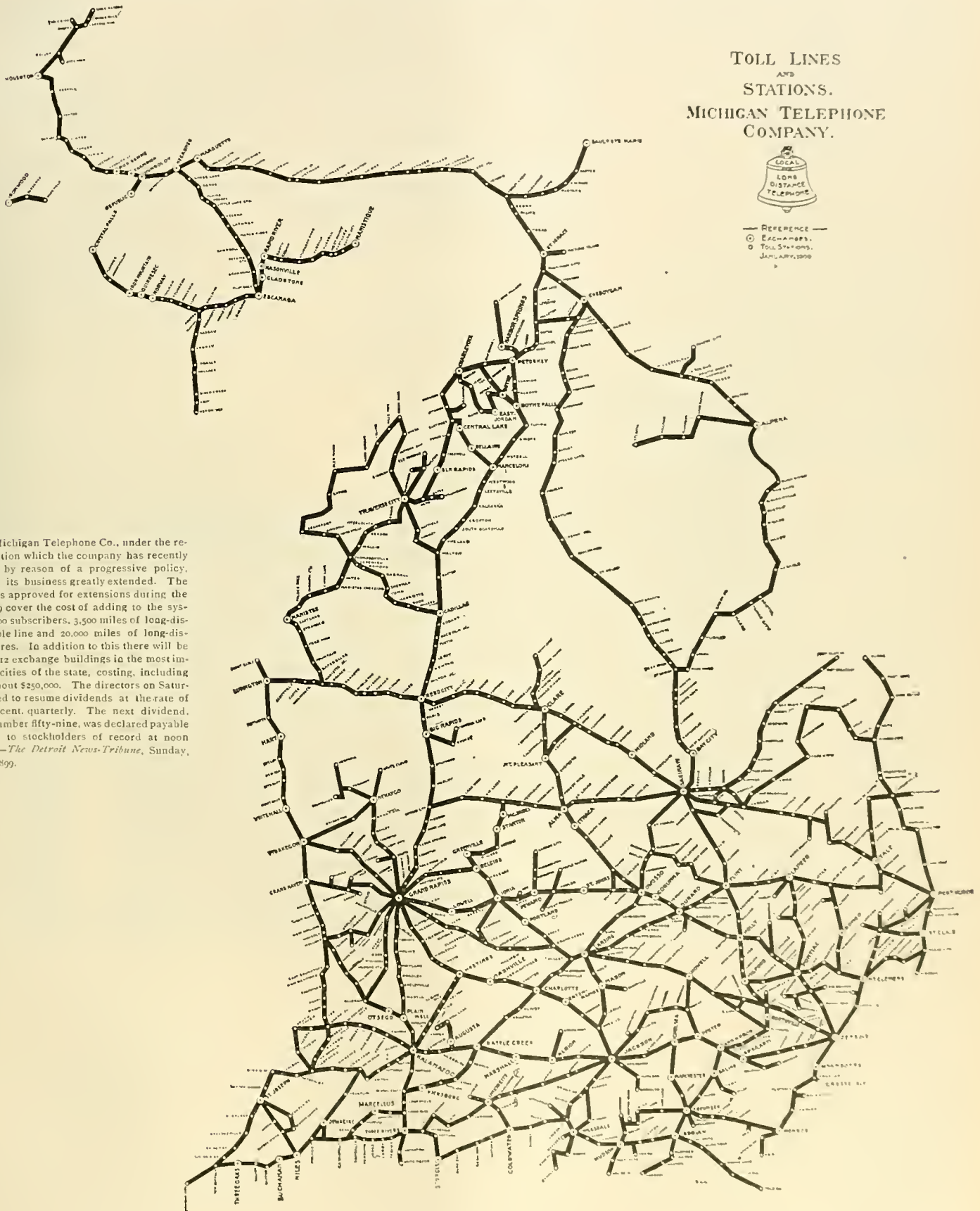
625,142. Telephone Receiver. Peter C. Burns, Chicago, Ill. Application filed February 23, 1899.

Claim is made for the combination with the shell of a magnet having a head thereon and an annular flange or rim on the head adapted to engage the edge of the shell, a diaphragm overlying the magnet and supported on the flange or rim and a cap overlying the diaphragm and secured directly to the shell, whereby the diaphragm and magnet are secured together in position.

625,151. Controller for Electric Motors. Harry P. Davis, Pittsburg, and Gilbert Wright, Wilkesburg, Pa. Application filed October 28, 1896. Renewed November 9, 1898.

The circuit making and breaking switch has a variable resistance between its terminals; an oscillatory head is

The directors of the Michigan Telephone Company have authorized the building of 3,500 miles of pole line and 20,000 miles of wire, connecting every city and town in the state with from one to ten circuits, as will be seen by the following diagram of the pole lines.



The Michigan Telephone Co., under the re-organization which the company has recently had and by reason of a progressive policy, has had its business greatly extended. The estimates approved for extensions during the year 1899 cover the cost of adding to the system 20,000 subscribers, 3,500 miles of long-distance pole line and 20,000 miles of long-distance wires. In addition to this there will be erected 12 exchange buildings in the most important cities of the state, costing, including land, about \$250,000. The directors on Saturday voted to resume dividends at the rate of 1 1/4 per cent. quarterly. The next dividend, being number fifty-nine, was declared payable May 15, to stockholders of record at noon May 11.—The Detroit News-Tribune, Sunday, May 7, 1899.

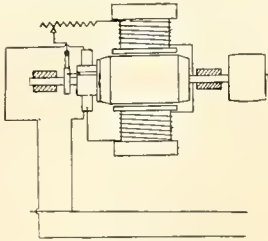
Illustrated Electrical Patent Record.

[Continued from page 306.]

geared to the movable member of the switch, and a rotatable shaft is provided with means for engaging and moving the head; a controller drum is loosely mounted upon the rotatable shaft and has a lost-motion connection therewith.

625,168. Electric Railway. Rudolph M. Hunter, Philadelphia, Pa. Original application filed May 9, 1887. Divided and this application filed October 4, 1889.

Two continuous suspended working conductors supply currents of opposite polarities. They are arranged at different levels from the ground and in different vertical planes. A series of supporting poles is common to both conductors, a collector moving in contact with each of the conductors and making an underrunning or moving contact therewith, and there are independent upward and rearward connections between the collectors and an electrically propelled vehicle.



No. 624,986.

625,172. Apparatus for Manufacturing Material Having Insulating Properties. Frederick Lamplough, London, England. Original application filed May 31, 1898. Divided and this application filed November 11, 1898.

This apparatus comprises a tank, a heating coil therein, a plate in front of the coil, a steam-supply pipe, a flask adapted to contain a volatile fluid, a connection between the flask and steam-supply pipe, a pressure regulator in the connection and a pipe for supplying compressed air to the tank.

625,183. Electric Arc Lamp. Paul Mersch, Paris, France. Application filed November 10, 1897.

An electric arc lamp, comprising solenoid coils, cores movable therein, a carbon-holder connected to the cores directly, another carbon-holder connected to the first-named holder in such a manner as to move in the opposite direction, and electrical connections by which the solenoid coils are connected in parallel with each other and with the carbons.

625,202. Commutator. John Risbridger, North East, Pa. Application filed March 22, 1899.

This commutator comprises a body or cylinder with stub segments secured upon it, blocks having base flanges at their ends and located between the stub segments, and removable contact segments attached to the stub segments with their ends overlapping the flanges of the blocks.

625,204. Process of and Apparatus for Tanning Hides or Skins. Pedro G. Salom, Philadelphia, Pa. Application filed April 8, 1898.

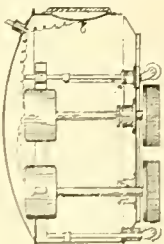
The process of tanning hides or skins consists in impregnating the hides or skins with a chromate and an acid and mounting the skins in an electrolytic bath, consisting of a tank, a series of grids of conducting metal having spongy lead mounted thereon and forming the negative pole of a galvanic couple and arranged to receive between them the skins to be tanned or tawed by reducing action of nascent hydrogen electrolytically produced.

625,219. Electric Switch. Clarence Truitt, St. Louis, Mo. Application filed June 20, 1898.

An electric switch for incandescent lamps comprises a series of extended and concentrically arranged contacts having connections with the binding-posts of a multiple filament lamp or pair of lamps, a separate series of concentrically arranged contacts adapted to be engaged one with the other, and an axially pivoted or actuated lever having bridging contacts between the contacts.

625,223. Electric-railway System. Louis E. Walkins, Springfield, Mass. Application filed September 27, 1897.

There is the combination with an electric switch of an electric motor and circuit conductors, a centrifugal governor, operated by the motor when the circuit for the motor is closed, a movable member of the governor serving to operate the switch.



No. 625,680

625,224. Non-arcng Controller for Electric Motors. Alexander J. Wurtz, Pittsburg, Pa. Application filed January 31, 1895.

A switching mechanism comprising a superimposed auxiliary chamber, the partition separating the chambers being provided with a restricted opening and with a larger valved opening.

625,246. Self-starter for Electric Motors. Henry H. Carter, Chicago, Ill. Application filed December 27, 1897.

The combination includes a circuit-controlling arm or element, a series of contacts or terminals over which the arm is adapted to pass, means for moving the arm in one direction or gravity or its equivalent, a spring or other self-actuating device for moving the arm in the opposite direction when under strain, and an electromagnetic device for passing the spring under strain.

625,247. Telephone Repeater. William M. Davis, Chicago, Ill. Application filed February 21, 1898.

A microphone transmitter is connected directly in the line; a second telephone line has means for producing talking currents on the line, and a connecting device joins the lines together, comprising two pairs of terminals, one pair being adapted to be connected with the first line and having in circuit between the same a source of electricity, a microphone transmitter and the primary of an induction coil, the second pair of terminals being adapted to be connected with the second telephone line and having in circuit therewith the secondary of an induction coil and a receiver situated opposite the transmitter.

625,252. Electrical Furnace. Hilliary Eldridge, Daniel J. Clark and Sylvain Blum, Galveston, Texas. Original application filed September 29, 1897. Divided and this application filed January 18, 1898.

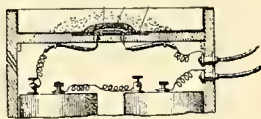
In an electrical furnace the combination with an inclosed furnace chamber having a cathode of a vertically adjustable fume-collecting hood suspended over the furnace chamber and an anode guided through and insulated from the hood.

625,255. Process of Producing Watermarks in or on Manufactured Paper. Thomas A. Goodchild and Archibald C. T. Bond, London, England. Application filed December 27, 1898.

The process described for producing in or on manufactured paper a disappearing but repeatedly revivable watermark which is invisible in a dry but visible in a moistened condition of the paper consists in placing on a platinum plate or sheet forming the anode a layer of absorbent material saturated with water, in placing on this and in a moistened state the paper which is to be watermarked and in pressing face downward on the paper a salient or other platinum design forming the cathode, so that the current from a source of electricity may pass through that portion of the paper which is in contact with the design on the cathode.

625,264. Electric Hand Fuse for Gas Burners. Friedrich Hoffmann and Wilhelm Ohlsen, Kiel, Germany. Application filed November 19, 1897.

The arrangement includes a gas burner and valve having a channel controlling the access of gas thereto, an auxiliary burner tube, carried by the valve and having the access of gas thereto controlled by the channel, a contact on the auxiliary burner tube and a fixed contact engaging therewith.



No. 625,133.

625,281. Electric-railway System. Louis E. Walkins, Springfield, Mass. Application filed March 7, 1898.

The first claim is for a series of conductor-rail divisions with separating intervals and a main-current feed wire, a series of electromagnets respectively provided adjacent each of the intervals and a metallic contact adjacent thereto, conductors joining the feed wire and the electromagnets and the adjacent metallic contact pieces, a movable device located at the separating intervals in line therewith and comprising as a part movable in unison therewith an armature adapted to be forced against the electromagnet by the passage of the car thereover, and having a portion also adapted to bear against the metallic contact piece and a conductor connecting the contacting armature with the conductor-rail division next in advance.

625,282. Electric-railway System. Louis E. Walkins, Springfield, Mass. Application filed January 14, 1899.

In an electric-railway system there is the third rail comprising separate longitudinally running current conductors, an alternating-current dynamo and current conductors connecting it with the third-rail members, and a motor car having thereon an alternating-current motor and a double-shoe trolley to bear on the conductor members, and circuit conductors connecting the shoes of the trolley with the motor, a direct-current dynamo mechanically driven by the alternating-current motor, and a direct-current car-propelling motor receiving its electrical energy from the direct-current dynamo.

625,283. Inverted Third-rail Electric-railway System. Louis E. Walkins, Springfield, Mass. Application filed January 21, 1899.

The inverted third rails, the brackets comprising risers and transversely extended portions at their tops, beneath which the inverted rails are sustained, insulating material between the rails and the brackets, and an insulating guard at the side of the riser toward the rail.

625,298. Galvanic Battery. George W. Frazier, Allegheny, Pa. Application filed April 6, 1898.

A zinc vessel is provided with a connector; a bag is constructed of asbestos cloth and adapted to fit the interior of the vessel closely, the bottom of the bag being closed by superimposed disks of asbestos cloth; a stick of carbon is placed centrally within the bag and provided with a conductor; ground carbon is packed about and beneath the carbon stick, filling the space within the bag, the particles of carbon being in conducting contact with each other and with the carbon stick and serving to prevent direct contact between the end of the stick and the asbestos disks; an excitant solution saturates the mass of ground carbon; the upper portion of the bag is folded inwardly against the carbon stick, and a body of asphaltum thereon seals the cell.

625,360. Electric Track and Wheel Brake. George B. Heath, San Francisco, Cal. Application filed August 27, 1898.

A combined electric track and wheel brake and a coil carried by the brake, the brake being vertically movable and slidingly mounted in relatively fixed guides to serve with either the front or rear wheels of a truck.

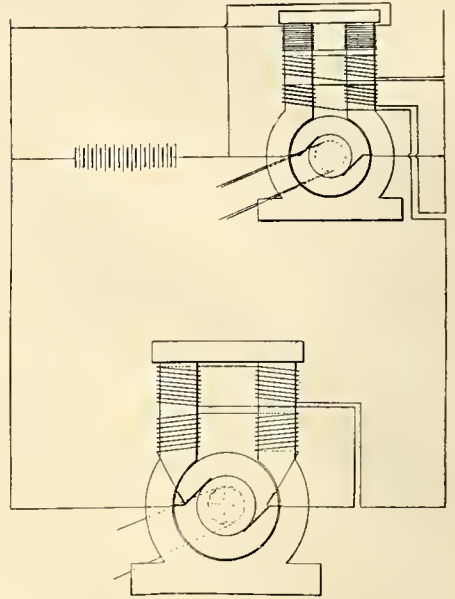
DESIGNS.

30,785. Motor Frame. Henry H. Wait, Chicago, Ill. Application filed April 12, 1899. Term of patent, seven years.

30,787. Incandescent Electric-lamp Shade. John Heskett Wright, Columbus, O. Application filed March 20, 1899. Term of patent, seven years.

30,792. Guard Rail for Street-railway Curves. Mason D. Pratt, Steelton, Pa. Application filed April 6, 1899. Term of patent, seven years.

30,794. Base and Casing for Portable Telephones, etc. Benjamin Le Vino, New York, N. Y. Application filed December 28, 1898. Term of patent seven years.



No. 625,098.

30,804. Manhole Cover. Thomas P. Greger, Philadelphia, Pa. Application filed April 6, 1899. Term of patent, 14 years.

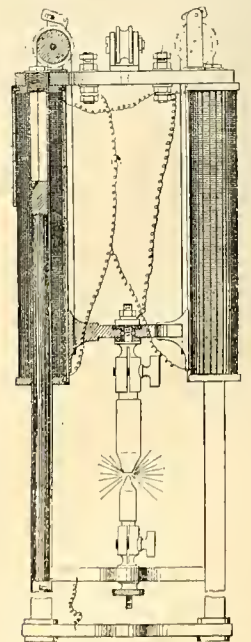
30,805. Manhole Cover. Thomas P. Greger, Philadelphia, Pa. Application filed April 6, 1899. Term of patent, 14 years.

30,806. Manhole Cover. Thomas P. Greger, Philadelphia, Pa. Application filed April 6, 1899. Term of patent, 14 years.

30,807. Manhole Cover. Thomas P. Greger, Philadelphia, Pa. Application filed April 6, 1899. Term of patent, 14 years.

30,808. Manhole Cover. Thomas P. Greger, Philadelphia, Pa. Application filed April 6, 1899. Term of patent, 14 years.

30,809. Manhole Cover. Thomas P. Greger, Philadelphia, Pa. Application filed April 22, 1899. Term of patent, 14 years.



No. 625,183.

30,810. Manhole Cover. Thomas P. Greger, Philadelphia, Pa. Application filed April 22, 1899. Term of patent, 14 years.

30,811. Manhole-cover Frame. Thomas P. Greger, Philadelphia, Pa. Application filed April 22, 1899. Term of patent, 14 years.

30,812. Manhole-cover Plate. Thomas P. Greger, Philadelphia, Pa. Application filed April 22, 1899. Term of patent, 14 years.

Western Electrician

EVERY SATURDAY.

Vol. XXIV.

CHICAGO, JUNE 3, 1899.

No. 22

New Chicago Telephone Building.

The Chicago Telephone company is now erecting on the 40-foot lot adjoining on the east its present main building at the corner of Franklin and Washington streets, Chicago, an eight-story addition, which will be extended over the old building, making, when completed, a building about 80 by 90 feet in ground dimensions and eight stories in height, the seventh and eighth floors being entirely devoted to operating rooms and quarters for the operating force. The accompanying pictures show the front of the present building and a drawing of the enlarged building as it will appear when completed.

The new operating room, occupying the entire upper floor, will have a vaulted ceiling, lighted by high windows and skylight, and will be one of the largest and best appointed operating offices to be found anywhere. In it will be installed relay multiple switchboards of the standard design, which will be of sufficient capacity to provide in the one room for the service of about 10,000 telephones. The seventh floor, immediately below the operating office, will provide for the operators' lockers and retiring rooms, as well as the lunch room, reading room, matron's department, etc.

The wire chief's quarters, containing the battery plant, power plant and distributing boards, which are so intimately related to the operation of a modern telephone switchboard, are located in the northeast corner of the new building. The wires leading to the exchange will be contained in 200-pair cables, led through iron pipes along the east wall and into the subways on Franklin and Washington streets.

Upon the sixth floor will be placed the toll-line switchboards, providing for the distribution of toll-line calls, enabling a subscriber in any exchange of the company to be served with dispatch and accuracy by operators handling the toll lines of the company, which radiate in every direction from Chicago and make almost a part of that exchange. In addition to its 12 offices in Chicago, which, combined, constitute the Chicago exchange, the company now operates telephones in about 140 towns in the district immediately surrounding the city, the principal suburban exchanges being in Joliet, Evanston, Aurora, Elgin, Oak Park and Waukegan.

The remainder of the building will be occupied by the general offices of the company. The treasurer's office and the contract department are located on the ground floor, where they are most accessible to the public. The executive forces of the maintenance, equipment, underground and construction departments and of the order and record department are located on the second floor. The offices of the president, general manager, general superintendent and superintendent are on the third floor. The auditing department will occupy the entire fourth floor, while the chief engineer's forces, special agents and city manager will occupy the remaining space on the floors above.

The architects of the building, D. H. Burnham & Co., and the contractors, Griffiths & Co., give assurance of its completion during the month of August, and the installation of the new operating apparatus will be begun in that month, so that by the month of November the new exchange is expected to be in operation, providing for the service of the subscribers in the main-office district. Three large modern telephone offices will then be in operation in the downtown district of the city—Main, Central and Harrison offices.

Another new building of the company, now being erected on Sangamon street, near Monroe street, to be known as "Monroe office," will be opened about November 1st and will accommodate about

4,000 telephones. The company purchased some time ago a lot on Chicago avenue, near Clark street, and a new building will be built at that point before January 1st.

The chief obstacle the company has had to encounter has been the impossibility of securing the electrical apparatus for equipping its new offices as rapidly as it was needed. As soon as the apparatus for equipping them can be obtained the company expects to erect its own buildings in Lake View, the Stock Yards, Englewood and other districts. Ground for most of these offices has already been purchased. All the buildings of the company are fireproof, provided with ample light and opportunities for ventilation, and are liberal in the provision of room and accommodations for the employees. In the operating rooms of the new main-office building

Mr. C. J. Warner's Electrical Reminiscences.

One of the honored veterans of the electrical industry is Mr. C. J. Warner of the Western Electric company of Chicago, with which he has been connected for many years. Mr. Warner's son, Mr. E. P. Warner, is electrical engineer for the Western Electric company. The older man was persuaded to give a brief reminiscence sketch of his career at the recent annual dinner of the Chicago Electrical Association. The address was very interesting, but all too brief. Mr. Warner spoke as follows:

"Having been invited by your president and others to be present at your banquet this evening, and to give some of my early experiences in the field of electricity, I have endeavored to get together such incidents and dates as came most readily to my recollection.

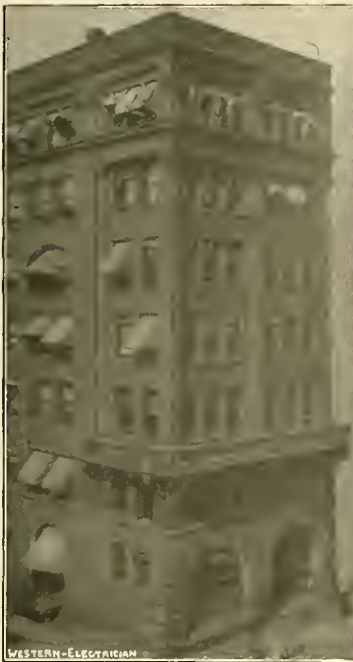
"I was born in London, England, in 1823, and at the age of 12 left school, a very poor one by the way, and hired as a shop-errand boy for Mr. Kerby, who had a small factory in which he manufactured philosophical instruments, principally for Dr. Ritchie of London University.

"In 1836 Mr. Kerby made the first needle instruments for Cooke and Wheatstone, and from that time up to 1843, when I came to America, I had many opportunities to see the instruments and become familiar with their method of operation. I remember seeing these needle instruments used for train signaling, or dispatching, as we call it now, on the London and Blackwall railroad, a single-track road, about three miles in length, operated by means of a cable passing over drums at the end stations. Signals were given by means of a single-stroke bell. The instructions were given by the needle instruments, and the engineer controlled the movement of the car accordingly. The batteries used were of the well-known voltaic type, made in wooden troughs divided by slate partitions.

"At about the time of which I have been speaking, 1840-1843, my brother John was em-

ployed as a foreman in the shops of Mr. F. M. Clarke in London, and also as assistant manager in the Adelaide Gallery in London. Mr. Clarke, at that time, made many forms of electrical apparatus, principally for use in schools and frequent exhibitions of his interesting productions were made at the Adelaide Gallery and Polytechnic Institute. I recall standing in a ring with others and feeling the wonderful shock produced by the electric eel, also seeing a life size figure of the Queen of England on horseback, formed of small pieces of tin foil stuck on sheets of glass and made luminous by a chain of sparks passing from piece to piece of the tin foil. As I remember, the electrical discharge was produced by a steam-jet machine.

"In the spring of 1843 Mr. Kerby, then my brother-in-law, and myself started a little shop in Dutch street, New York, where, in addition to electrical work, we made a variety of things, such as candlesticks, which made their own candles as they burned away, and walking-stick umbrellas. Colonel Colt, the famous revolver man, was one of our patrons, and we did some of the work on his early experiments. The colonel brought Professor Morse to



Present Building.



Building with the Addition Now Making.

NEW CHICAGO TELEPHONE BUILDING.

the plan of ventilating which has been so successfully used in the present main building will be continued. This provides that the air entering the office be washed, then dried, heated in winter and cooled in summer, and forced into the rooms in such quantities that the entire volume is changed about once in three minutes. It is needless to say that the telephone operators employed in these rooms are afforded the cleanest and the best air for breathing purposes to be found anywhere in the city. It is also found that the delicate appliances making up telephone apparatus can be maintained in very much better condition when free from the soot and dirt which is blown through an open window in Chicago.

The commissioner of Indian affairs is inviting sealed proposals, until June 15th, for furnishing the materials and labor required to construct an electric-lighting system at the Chillicothe Indian Industrial School, Oklahoma. Further information may be obtained upon application to the Indian Office, Washington, D. C., the Indian warehouse, 1602 State street, Chicago, Ill., or to the superintendent of the school at Chillicothe.

our shop and we made some needle instruments for him.

"In 1854 I came West and settled in Ottawa, Ill., where I was employed by the Illinois and Mississippi Telegraph company as an instrument maker. Judge John D. Caton was at that time very actively engaged in the promotion of telegraph lines, and when the Western Union Telegraph company was formed it leased many of the lines which he had constructed, and took control of the shop at Ottawa. During the war of the Rebellion, from 1861 to 1865, the shop was mostly engaged in the manufacture of telegraph apparatus for use in the army, such as pocket relays, etc.

"With the exception of about three years, I remained with the Western Union Telegraph company until 1872, and I recall as one of the most interesting developments of that period, from '65 to '72, the efforts made to understand and adjust the resistance of telegraph instruments and lines. Operators had discovered that relays with many turns of wire and high resistance would operate on a line where those with but few turns and low resistance would not, and the consequence was that the operator who could manage to get his relay wound high, often without the knowledge of his superintendent, thought he had a great joke on his brother operators.

"President Orton of the Western Union Telegraph company made a trip to England, and on his return brought with him a Varley differential galvanometer and balancing rheostat; this was, I believe, the first resistance-measuring apparatus used in this country.

"In 1872 the shop of the Western Union Telegraph company at Ottawa was sold to be consolidated with another shop which had been operated by Gray & Barton in Chicago, and the Western Electric Manufacturing company was formed. In June of that year I entered the employment of the new company, and up to the time of the invention of the telephone in 1877 was engaged almost exclusively in the making of the Gray printing-telegraph instruments. When the first accounts of Professor Bell's wonderful invention appeared, I remember discussing its probable field of usefulness with others and hearing many express the belief that there would be little demand for it in actual business, and that there was not the least danger of it superseding the telegraph. I believe the most visionary and enthusiastic electrical promoter of that day did not reach in his imagination anything like the development of the present day. Gen. Anson Stager, who was one of the principal organizers of the Western Electric Manufacturing company and its first president, was a man of progressive ideas and quiet enthusiasm over new inventions, and I have always felt that he, perhaps, more nearly than any other man, at that time appreciated the immense possibilities of the telephone.

"Born when the steam-engine was a mere baby and the telegraph in swaddling clothes, I have watched the years roll by and the children grow and develop, unable, through lack of early education, to take a leading part in the training, but always most deeply interested, and adding my mite cheerfully to the performance of the great task."

Lightning Struck in the Pulpit.

The Rev. H. H. Baldwin, an aged preacher, was killed by lightning while conducting a religious service at Fountain, in Dewey County, Oklahoma, May 25th. For a week he had been conducting a revival and the little church was crowded. He gave out the hymns and led in prayer, and then went to the Bible and gave out his text. Then the storm broke. He appealed to the congregation to lead better lives and to feel a spiritual calm after a life of sin, the roughness and turbulence of which he compared with the violence of the storm raging out of doors.

Just then a crash of thunder came, while a brilliant flash almost blinded those in the front pews. When they recovered from the confusion the minister lay on the floor dead. The congregation was in a great state of fear, and the men in the audience, mostly cattlemen, feared to approach the body for some minutes. The women screamed and some fainted. Mr. Baldwin had been living in the territory several years, his home before that being in Illinois.

Lightning on Thunderbolt Hill.

'From the Cincinnati Enquirer.'

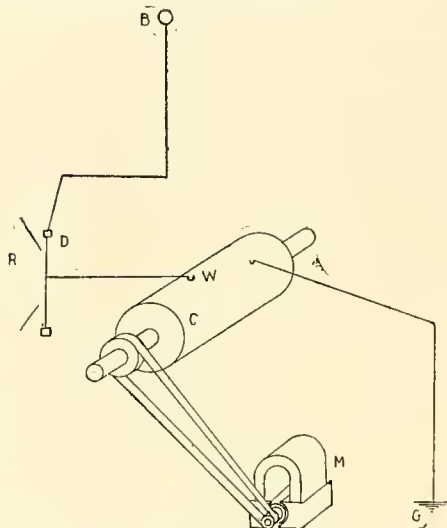
Lawrenceburg, Ind., May 24.—The frequency with which lightning has struck the summit of a towering hill on a farm of John P. Walker has attracted attention for years, but no explanation could ever be given for it. Sometimes as often as three or four times in succession during the brief period of an electrical storm would lightning strike there. Several days since John Mason, the expert, who is prospecting among the hills and hollows of the lands leased by the Sale Gold Mining company, was overtaken in the vicinity of "Thunderbolt Hill," as the electrical mountain has been nicknamed by the natives, and sought shelter beneath the spreading branches of a stubby oak on an adjacent ridge. While there he was treated to a display of celestial fireworks that for magnificence and grandeur surpassed his power of description. He made the discovery that the hill was filled with iron ore and other minerals so close to the surface as to attract the lightning.

Proposed Receiving Apparatus for Electrical Waves in Space.

Mr. J. J. O'Connell, one of the engineers of the Chicago Telephone company, who has devoted considerable study and experiment to the subject of sending electrical signals through space without connecting wires, thinks that it may be possible to substitute for the coherer used by Marconi and the other experimenters the receiving apparatus roughly outlined by the accompanying diagram.

Referring to the reference letters in the sketch, (B) is the ball or exposed surface of the "wireless-telegraph" system, connected to the diaphragm (D) of a receiver (R). Attached to the diaphragm is a wire of platinum or other metal, making a light brush contact (W) with the cylinder (C), which is revolved at a predetermined rate of speed by the motor (M). Also lightly contacting on the cylinder is a connection to ground (G).

Mr. O'Connell's plan contemplates the following



PROPOSED RECEIVING APPARATUS FOR ELECTRICAL WAVES IN SPACE.

method of operation: A smooth metallic cylinder slightly oxidized, or its equivalent, is set in motion. On it rests one end of a metallic rod or wire, the other end of which is attached to a diaphragm. As the cylinder revolves no motion is transmitted to the diaphragm, the friction being so slight and regular at the contact, but the moment an electric impulse takes place it flows over this slight contact and causes cohesion to take place, or slightly increases the friction, and the diaphragm is thrown into vibration. In this way, it is believed, signals may be received at great distances.

Lightning Flashes.

The fascinating study of atmospheric electricity, in which there has been so much general interest

for the Education of Deaf and Dumb, to contribute an interesting photograph of a lightning flash at Effingham, Ill., which he succeeded in getting on July 29, 1898, at 9:30 p. m. The accompanying cut is an exact reproduction of the original photograph.

COMMUNICATION.

Prof. Thomson's Comments on Lightning Phenomena.

To the Editor of the Western Electrician:

The magnificent picture of a lightning flash reproduced by you from a negative by Mr. W. C. Gibbon, and appearing in your issue of May 13th, interests me greatly. It shows in a most beautiful manner the character of the phenomenon of the lightning flash. I have never seen a picture which shows so much. It will be noticed that the ground flash is fed from several directions by forked streamers extending through the cloud mass. The increase in brightness of the branch at the extreme left simply indicates that that branch is nearer the observer or in the cloud directly overhead in front of the camera. The branch which streaks off to the left, and apparently downward, is probably in the cloud layer beyond the main flash or ground flash, its position being due to perspective. To the right there are also branches to feed the main flash, and a number of faint branches are to be seen here and there, which are probably so far distant within the cloud mass itself as to be partly obscured by the fog. The ground flash itself seems to have divided, sending off a vigorous branch to the right, at about one-third of its extent upward, as it appears.

The thunder produced by such a flash would probably be heard as a preliminary roll, followed by a tremendous explosive noise, and this again followed by a roll fading away. The first noise to reach the observer at the camera would be from that portion of the flash to the left, which you remark as increasing in brightness, and gradually the more distant portions of the flash would communicate their sound. The noise of the main ground flash would probably come as one terrific explosion, on account of the average distance from the observer at the camera to the streak not being greatly different for the different parts of the streak; while the more distant ramifications, both above it in the cloud layer and farther away than the ground flash, would contribute the final roll.

Many observers of thunder and lightning have been struck by the fact that, judging from the sound, the stroke has often been thought to be much nearer than it actually was found to be when the lightning struck some object and left a record of its action. The simple explanation is that the cloud discharges feeding the main flash may be directly overhead in part (as is beautifully indicated in the picture), or much nearer the observer than the main discharge, and the sound wave reaching the observer's ear begins, of course, with the noise produced by the nearest ramifications, and winds up with those farthest away.

Recently, here in Lynn, this condition of affairs had a fine illustration, inasmuch as a heavy discharge, which, by actual count of time to the beginning of the thunder, would not have been more than 2,000 feet away from where I was, in reality was about a mile away in a direct line. The thunder,



LIGHTNING FLASHES.

manifested of late, is receiving an impetus from the increasing use of the camera in recording the action of lightning. The publication in the Western Electrician of May 13th of a picture of a lightning flash in South Dakota has elicited interesting comments and suggestions from those interested in the same line of study and has prompted T. J. Mainline, an instructor in photography at the Illinois Institution

however, was characterized by an extremely violent and explosive noise, occurring at about the right time interval to correspond to the distance of the main or ground flash, and the thunder terminated by a minor series of rolling noises, which indicated that the flash had been fed from several directions in the cloud layer. ELIHU THOMSON.

Lynn, Mass., May 18, 1899.

Underground Distribution of Two-phase Current In New York City.¹

By E. A. LESLIE.

The purpose of this paper is to comment briefly upon certain features of two-phase distribution in New York city which may possibly be of interest to the members of this association.

The company with which I have the honor to be connected decided about two years ago to substitute two-phase for single-phase distribution, but one of the very first difficulties encountered was the subway situation, which, as you are all aware, is unusual and, perhaps, peculiar to New York alone. In the early days the high-tension companies operating in this city apparently imagined that they could go on lumbering up the streets with dangerous and unsightly poles and wires to an indefinite

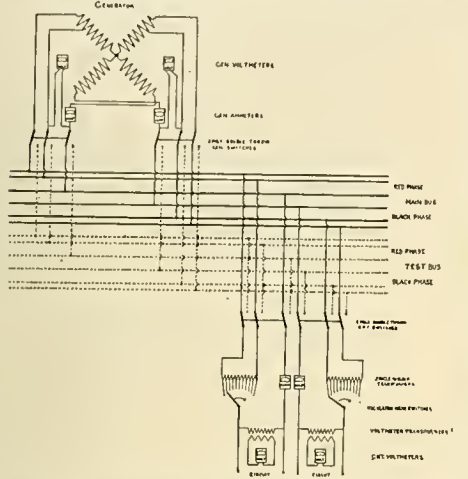


FIG. 1. UNDERGROUND DISTRIBUTION OF TWO-PHASE CURRENT IN NEW YORK.—SWITCHBOARD AND REGULATING APPARATUS.

extent and for an indefinite period, and, relying upon the theory of vested rights, refused in the most peremptory fashion to devise and lay down their own underground systems. The result was special legislative enactment, the contracting by the state with a private concern for the furnishing of underground facilities and one general subway system of the simplest design for Manhattan Island, which all high-tension companies were obliged to use in common. Every engineer present will appreciate the difficulty of laying out an ideal underground system, even for one occupant, in a crowded and busy city like New York; yet to do so for a half dozen actively competing concerns, with almost as many different systems of operating, would be little short of a physical impossibility, and I therefore believe that the subway company is amply justified in assuming that its ducts, manholes and distributing boxes afford "adequate underground facilities" within the meaning of the law. The trouble is that with so many occupants it is not practicable to provide room under ground for junction boxes, large transformers and other apparatus necessary for a reliable system of meshed conductors, without which no company can, in my opinion, hope to compete to advantage with direct-current distribution.

Without junction boxes we were afraid to mesh our

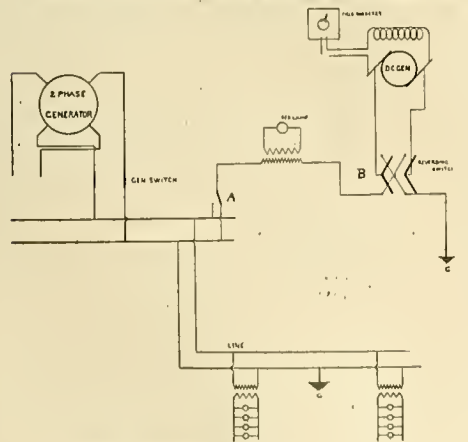


FIG. 2. UNDERGROUND DISTRIBUTION OF TWO-PHASE CURRENT IN NEW YORK.—METHOD OF LOCATING FAULTS ON LIVE CIRCUITS.

conductors, and for this reason and the possibility of patent complications we adopted the four-wire method, consisting of two circuits, the currents thereon differing 90 degrees in phase. These circuits are operated practically the same as single-phase circuits, except that their distributing mains necessarily parallel each other, and, therefore, while with single-phase distribution we formerly employed but one distributing main in any given section, we now employ two. This is, of course, necessary to enable us to supply current for power purposes in units

1. Read before the National Electric Light association at New York, May 23-25, 1899.

of five horse power or over; but it also has this decided advantage, that it enables us to provide, at slight expense, a second source of supply for lighting and single-phase motors, in large and important installations, where an interruption of considerable duration might result in serious consequences. For this purpose a special non-arcing switch is provided, making it perfectly safe for anyone to throw over from one circuit to the other the heaviest loads our largest customers are ever likely to use. These loads sometimes reach as much as 100 kilowatts, but as our generators, ranging in capacity from 300 to 450 kilowatts each, all run in parallel, and the circuits consequently are all fed from common bus-bars, the unbalancing effect of such switching over is rarely felt to an annoying degree. Of course it is always desirable to preserve a fairly good balance, and these switches are frequently employed for this very purpose.

Another advantage over the three-wire, two-phase system is the comparative ease with which trouble may be located and removed, a "short," for instance, on one phase not necessarily affecting the other; whereas, with a three-wire underground cable, the insulation of all the wires is likely to be destroyed in case of trouble, and both phases consequently interrupted until repairs can be effected.

We also continued the house-to-house transformer method, except in blocks where one installation could be made to serve a number of customers; first, because to distribute from sub-stations would involve large sums for rental or compel their being shifted about from time to time at the caprice of the property owner; second, the operation of such sub-stations would involve more or less labor; third, the secondary wires would require large investment for copper, and, fourth, because the subway rental for the secondary wires would constitute a very heavy additional charge. We concluded, therefore, that the house-to-house method, under the conditions existing here, would be the more economical, and in the end afford more satisfactory returns. This, however, would not be the case with exclusive and what might be termed "extraordinary" subway facilities of our own providing.

The most serious difficulty encountered was the switchboard and regulating apparatus. Formerly our generators were small, not exceeding 60 kilowatts each, and as they were run independently, the number of lamps connected on each circuit was necessarily governed by the capacity of the machine, and the regulation of the pressure was usually effected on the machine itself. The boards rarely ex-

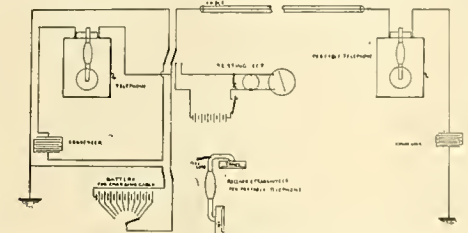


FIG. 4. UNDERGROUND DISTRIBUTION OF TWO-PHASE CURRENT IN NEW YORK.—USE OF TELEPHONE ON UNDERGROUND ELECTRIC LIGHT-CABLES.

ceeded 25 primary amperes, and could be switched from one generator to another without serious danger of arcing or practical interruption to the circuit. With the adoption of the two-phase system, however, generators of from 300 to 450 kilowatts were substituted and run in parallel; the number of circuits was largely reduced, and the loads on those remaining were increased to 100 amperes. We quickly found that we could not throw loads of 100 amperes at a pressure of 2,500 volts on the ordinary switchboard without dangerous arcing and annoying interruptions to lights and motors. Neither could we satisfactorily regulate our pressure. In order, therefore, to secure safety and convenience, and at the same time control the pressure of each circuit independently of the others, it became necessary to adopt a special form of switchboard and regulating apparatus, as shown in Fig. 1, which was devised by W. F. Wells, the assistant general manager of the Manhattan Electric Light company of this city, and a brief description of which may be of interest.

Our circuit records for the past 10 years made it plain that, with a constant pressure maintained at the different centers of distribution, the difference of potential required at the generating ends of the various circuits at any one time would not be more than 10 per cent. of the total. We therefore brought out a third lead from the stator armatures of our generators, as shown in sketch, so as to give us 10 per cent. of the total voltage; that is, with the machine generating 2,500 volts on each phase, we should have 250 volts between leads Nos. 1 and 2; 2,250 volts between Nos. 2 and 3, and 2,500 volts between Nos. 1 and 3. The six leads from each machine (three on each phase) are carried through a three-pole, double-throw switch in the switchboard to the bus-bars, of which there are two sets of six each, as shown. Ordinarily, but one set of bus-bars is used, as the generators are run in parallel, the other set being held for testing or the operation of a circuit singly, if desired. The circuits are connected to these bus-bars by similar switches. Lead No. 3 from the switch, after passing through an amperemeter, goes direct to the circuit. Leads Nos. 1 and 2 are connected to the terminals of a

single-wound transformer, one-tapped, called an "autotransformer" or "economy coil." This coil has 11 leads brought out, dividing the coil into 10 equal parts, each part representing one per cent. of the total primary voltage. These 11 leads are carried to an 11-point switch of the regulator-head type, so that any potential between 00 per cent. and full voltage of the machine (in one per cent. steps) may be run on the circuit. We are, therefore, able to keep the station end of the circuit correct within one-half of one per cent.

Owing to the cost of subway rentals and other reasons, we have been deterred up to the present time from using pressure wires from the centers of distribution. In order, therefore, to ascertain at least approximately what pressure is required at the generating station by each circuit at the various loads, we have taken a number of voltmeter readings at representative points on the distributing mains of each circuit and simultaneous readings at the switchboard, and from these have prepared sched-

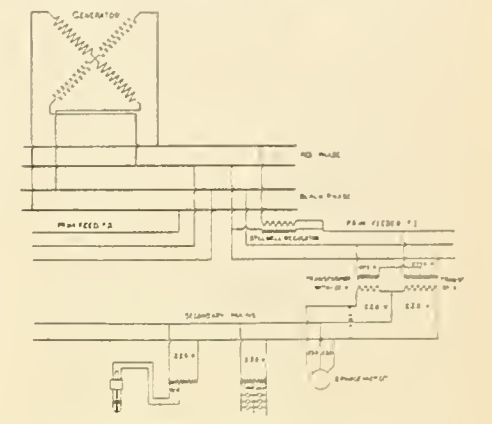


FIG. 5. UNDERGROUND DISTRIBUTION OF TWO-PHASE CURRENT IN NEW YORK.—MODIFICATION OF MER-SHON DISTRIBUTION SYSTEM.

ules showing the voltage required for each five amperes of load. In some cases we have placed on the amperemeter scale, directly underneath the ampere figures, the voltage required for any given load. These schedules require frequent checking and alteration whenever changes are made in the cables, or in case the centers of distribution vary with the season, the connection and disconnection of customers or the inductive characteristics of the load.

Plug and cable connections were also added to the board, in case greater subdivisions of circuits were needed than could be obtained on the two sets of bus-bars. The synchronizing devices and pilot lamps of the machines are connected across the 10 per cent. coils, and, therefore, switchboard transformers are not required for these purposes.

The instruments used are hot-wire Hartmann and Braun amperemeters, imported from Germany; Thomson inclined-coil voltmeters with transformers on the circuits, and Stanley static voltmeters on the generators.

TESTING FOR FAULTS.

Notwithstanding the greatest care in the selection of insulation and the most rigid specifications for the guidance of manufacturers, faults will occasionally develop in our cables, which are due, either to inherent defects or lack of proper mechanical protection. In such cases the necessary interruption to the circuit for purposes of repair is an exceedingly

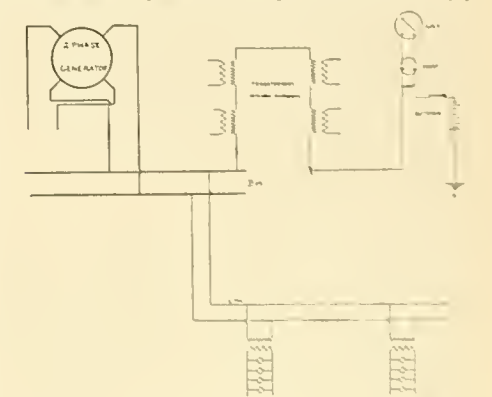


FIG. 3. UNDERGROUND DISTRIBUTION OF TWO-PHASE CURRENT IN NEW YORK.—METHOD OF MEASURING INSULATION RESISTANCE ON LIVE WIRES.

important matter, and, if frequent or long drawn out, will invariably result in loss of prestige and business. Therefore, to facilitate the removal of the fault as much as possible, it was formerly our practice, whenever one of our alternating circuits became earthed, to isolate it from the other circuits by throwing it on the "test" bus in connection with a spare generator, and use a device for locating the trouble which was designed by Superintendent Sparrow of the Manhattan company. It includes the apparatus shown in Fig. 2, herewith.

A single-pole, double-throw switch (A) is at-

[Continued on page 317.]

Means of Attaining Safety in Electrical Distribution.¹

By W. L. R. EMMET.

I have not selected this subject with the intention of fully discussing all its features, but rather for the purpose of bringing to the notice of this association certain matters of practical importance, concerning which radical differences of opinion exist among persons prominent in the electrical industry, and also for the purpose of pointing out some of the new problems which have been presented by recent developments of the electrical art, and which have not been fully considered in the adoption of the present standards of practice.

The persons most interested in the standardization of safe electrical methods are the fire underwriters; they have for years maintained a system by which statistics are carefully compiled and codes of rules adopted. These rules are revised from time to time, and their requirements in recent years have been

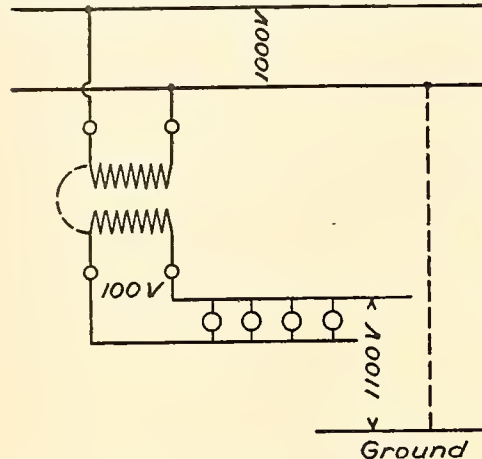


FIG. 1. MEANS OF ATTAINING SAFETY IN ELECTRICAL DISTRIBUTION.

nearly uniform all over the country. They have at different times been indorsed by this association, and by other bodies representative of the electrical profession, and have, as a rule, been accepted as the standard by users of electrical apparatus. These rules are based upon experience gained from existing apparatus and methods, and, naturally, cannot consider or provide for future possibilities; consequently they must be modified from time to time in order that the progress of the art may not be obstructed.

The principal sources of danger in electrical distribution are: First, heating of conductors by current; second, failure of insulation; and, third, arcing when circuits are intentionally or accidentally broken. Of the first of these causes of trouble very little need be said, since the standard system, by which a cut-out protects every conductor, is an adequate safeguard,

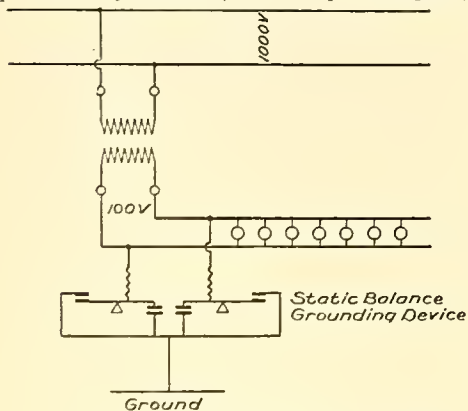


FIG. 4. MEANS OF ATTAINING SAFETY IN ELECTRICAL DISTRIBUTION.

provided the cut-out is capable of safely breaking any current to which it can be subjected. The second source of danger that has been mentioned is insulation, and this subject is one that must always receive much consideration, since the mechanical possibilities with available insulating substances are strictly limited, and since the sources of deterioration are many and difficult to avoid.

The best path to safety in electrical distribution lies in the avoidance of high-potential differences in places where life or property can be endangered. The difficulties of insulation increase very rapidly as the voltage is raised, and while it is possible to insulate for very high voltages, in small space in special cases, the difficulties multiply themselves almost in proportion to the square of the voltage increase. In electrical distribution there are two ways by which danger from high voltage can be avoided. First, by abandoning high voltage altogether, and, second, by providing means by which it cannot exist on parts of the circuit where life or property can be endangered. We have good examples of the former of these

methods in the large, direct-current, three-wire systems operating from generators with about 125 volts on a side. With this voltage the dangers from failure of insulation are very small, and I think that an investigation would show that most of the fires that have been caused by such systems have arisen from heating of conductors or failure of circuit-opening devices. The scope of such low-tension distribution is, of course, restricted, while the use of high voltages enables us to distribute over large areas with much greater economy and efficiency than is possible with low voltage alone. The desire to effect these economies has led in many places to the installation of high-voltage apparatus for supplying power to these same three-wire systems. The existence of these conditions compels us to look for means of securing safety where power is transmitted at high voltage. There is but one sure means of accomplishing this end, and that is by preventing the existence of the high potential on parts of the circuits where life or property can be endangered. We will consider some of the methods by which this end can be accomplished.

Fig. 1 shows the simplest arrangement of a primary and secondary circuit as they are now generally installed in this country, and illustrates a condition under which this arrangement may become dangerous. The dotted lines show connections that may be accidentally made, one showing a cross between primary and secondary, either in the transformer or out of it, and the other, a connection of one of the primary leads to the ground. The primary voltage being 1,000 and the secondary 100, the making of these connections immediately establishes a potential difference of 1,100 volts between part of the secondary circuit and the ground. This pressure will, as a rule, be too much for the insulation of combination fixtures, and the first indication of trouble is likely to be a fire, if it be not a shock received by someone who happens to establish a cir-

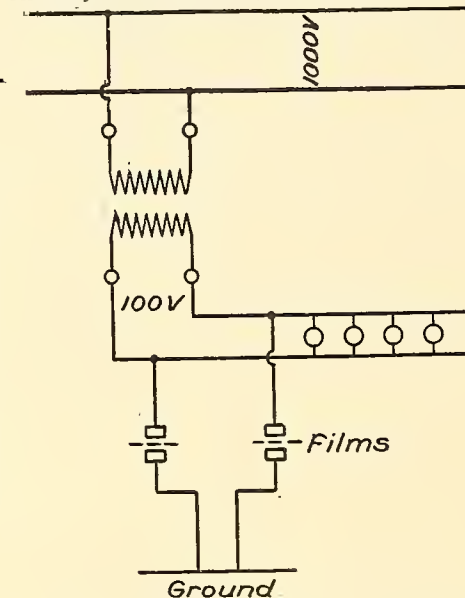


FIG. 3. MEANS OF ATTAINING SAFETY IN ELECTRICAL DISTRIBUTION.

cuit through his body between the ground and some lamp socket or other part that is not sufficiently insulated from the secondary circuit. The method of installation shown in this figure is almost universally adopted wherever alternating currents are being used in this country. It is, in fact, virtually compulsory upon the average station manager, since no established method of overcoming the difficulty is available that does not violate the fire underwriters' rule that all house wiring shall be free from any connection to ground. If this rule is disregarded, we may adopt the arrangement shown in Fig. 2, which entirely overcomes the difficulty, and which is open to no objection except that the insulation between one side of the secondary and ground is subjected to the voltage of the secondary circuit.

With the arrangement shown in Fig. 1 it is quite possible that the secondary insulation may be subjected to a considerable part of the primary voltage, even when there is no ground connection on the primary circuit. The potentials on insulated circuits carrying currents tend by static induction to balance themselves with respect to the ground, so that the potential of the ground is normally neutral to that of the two conductors. Where circuits are long, and operate at high potentials, a considerable flow of current between one conductor and ground may be required to materially disturb this neutrality. This has been illustrated to many of you by the lighting of ground-detector lamps from circuits that are perfectly insulated. When a secondary becomes crossed with a perfectly insulated primary, these static-capacity currents tend to flow to ground through the secondary insulation. We know by experience that under the most ordinary conditions, on 2,000-volt circuits, these currents are of sufficient volume to light ground-detector lamps, and we know that almost any current of ordinary potential-transmitting power enough to light a lamp may, under certain conditions, cause a fire.

So long as the secondary circuit remains insulated

from ground these dangers will exist. The remedy for the trouble must be either in the permanent connection to ground, as in Fig. 2, which is now prohibited by one of the underwriters' rules, or in the installation of some device by which the secondary is grounded automatically when the emergency arises. Figs. 3 and 4 show methods used to accomplish this purpose, and Fig. 5 shows a method for preventing contact between primary and secondary of a transformer by the introduction of a grounded shield, which has been used to some extent with a view to avoiding the danger above described.

The objections to this method are: First, that it affords no protection against crosses between primary and secondary which may occur outside of the transformer itself; second, that it introduces expense, since the shield must be made heavy enough to carry current sufficient to blow the primary fuses, and at the same time must be so arranged that it will not introduce serious eddy-current losses, and, third,

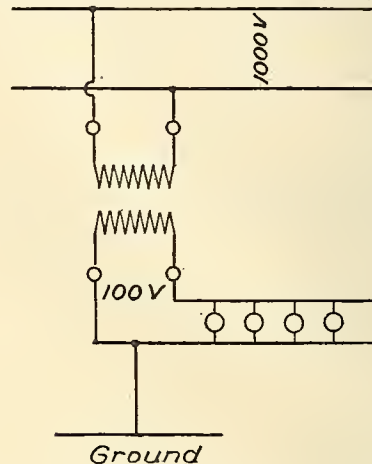


FIG. 2. MEANS OF ATTAINING SAFETY IN ELECTRICAL DISTRIBUTION.

that it probably renders the transformer more subject to injury from lightning.

Fig. 3 shows the secondary separated from ground by films of insulating material, which are intended to puncture when the voltage to ground rises above a certain point. The objection to this method is that the films are likely to be uncertain and variable in their insulating qualities, and may, under certain conditions, be punctured by the secondary pressure.

Fig. 4 shows the same object accomplished by means of static balances, whose motion, by rise of potential difference, causes the circuit to be grounded. Another device has been suggested, in which a magnet is placed in series with a vacuum tube between the secondary and ground. When the potential difference rises the discharge through the

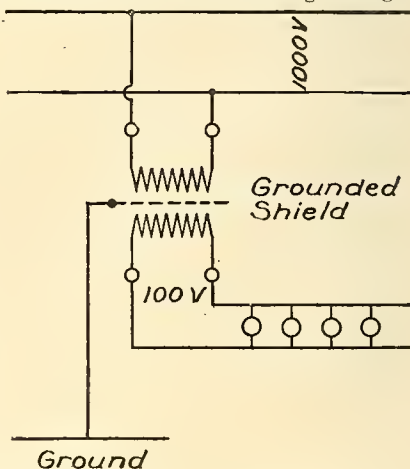


FIG. 5. MEANS OF ATTAINING SAFETY IN ELECTRICAL DISTRIBUTION.

tube is increased, and the magnet starts mechanism which grounds the secondary circuit. The objection to these devices is that they are not perfectly instantaneous in their action, and that the secondary insulation may break down elsewhere before they accomplish the desired result. They are also necessarily more or less complicated, and liable to fail on that account.

As I have said, the permanent grounding of transformer secondaries is prohibited by the fire underwriters' rules, which prohibition is generally respected throughout the country, so that most secondary circuits are entirely unprotected from the trouble above described. There are, however, some very important exceptions that afford useful examples of the safety of operating secondary circuits with permanent ground connections. I allude to some of the large Edison companies, which have recently installed high-tension alternating apparatus to supply power to existing three-wire systems through rotary converters. In a rotary converter the collector rings and commutator connect to the same winding, so that the direct-current leads are

¹ Read before the National Electric Light Association at New York, May 23-25, 1899.

as much a part of the transformer secondary system as if they were connected directly to it. Most of these large Edison companies have for years been operating with neutral conductor grounded. This grounding has in most cases first occurred through chance or accident, and the practice has been persevered in, partly because it would be a difficult matter to avoid neutral grounds and partly because the grounded neutral is, for several reasons, very desirable.

Fig. 6 shows the condition existing in such cases. In these cases two rules of the National Board of Fire Underwriters are violated: First, the secondary system to which all house wiring is connected is permanently grounded, and, second, a primary voltage of 6,000 is used, while the underwriters' rules state that house wiring must not be connected to the secondaries of transformers whose primaries receive current at voltages above 3,000. In spite of these violations, the circuits are just as safe as they were before the high-tension power was used, and safer than they were before their neutrals were grounded, although at that time no high-tension apparatus had been installed. Both of these rules should, and in time will, be abandoned, the first, because it leads to danger rather than safety, and the second, because it endeavors to fix an unnecessary barrier to progress. The interests of insurance

very generally either grounded or protected by some such automatic devices as I have described. The prejudice against grounded circuits in buildings has always been very strong in this country, and, in my opinion, has been carried to unreasonable lengths. Grounded circuits of moderate potential can, with very simple precautions, be installed in buildings with perfect safety.

The third cause of danger in electrical distribution which I have mentioned is arcing through accidental opening of circuits or through failure of circuit-opening devices. Fuses, switches and circuit-breakers are subjects upon which a great deal could be said in discussing means of attaining safety. Many of the circuit-opening devices that have been introduced in the past have been capable only of breaking certain definite currents, and incapable of coping with the conditions existing when a very large system is short-circuited. Most of the switchboard devices that are now in use for alternating work are strictly limited in the range of their safe action, and would be valueless on a circuit capable of delivering a large amount of power.

In the past alternators have been generally used singly and in comparatively small units, the total power that could be delivered to one point being limited to the maximum output of one machine. In many of the installations now being made numbers

have not been much used. Their introduction naturally somewhat affects voltages, and for this reason may be considered undesirable. By judicious arrangement and proportioning, the objection can, to a great extent, be overcome, and there is little doubt that such devices will be much used in the future.

I have prepared sketches of a few circuit-opening devices that have resulted from recent investigations and experiments, and will briefly describe their design.

Fig. 7 shows a fuse block in which the fuse is in a state of tension between two hinged terminals; these terminals are pulled apart by springs and receive current through flexible connections. The fuse is punched out of sheet metal, the narrowest portion being at the middle. It is placed between two blocks of porcelain, a small amount of clearance being provided where the fuse passes through, so that its ends can be freely withdrawn by the movable terminals after the narrow part of the fuse has become ruptured. Around the narrow part of the fuse the porcelain blocks are recessed so as to provide an air chamber; this chamber is vented by a hole in the upper block. The whole device is firmly clamped together, so that the only opening to the outer air is through this one vent-hole. The fuse, being under tension, does not quite reach the melting point before the break occurs. It loses its tensile strength at a low red heat and pulls apart. It is quickly withdrawn by the springs from the air chamber in which it has been broken. A very small amount of the metal is volatilized and its gas is blown out of the vent-hole. For the purpose of preventing any deposit of metal fumes on the porcelain surfaces, these surfaces are lined with muslin that has been treated with shellac or varnish and pressed into the desired shape. This lining covers the interior of the chamber in which the fuse is broken, and the porcelain surfaces between which the fuse is drawn. These linings are supplied with the new fuses, and are renewed if any appreciable amount of burning has occurred.

With a fuse of this type, occupying a space of six inches by three inches on a switchboard, I have repeatedly broken 300 amperes at 13,000 volts without the slightest injury to the device.

Fig. 8 illustrates the principle of a circuit-breaker that has produced excellent results. Two terminals are placed side by side on a vertical board, and are separated, both in front and behind the board, by high barriers. Into the metal surrounding these terminals stout fiber tubes are attached, which extend downward on either side of the barrier. Two copper rods, connected at the bottom by a cross-head, are inserted in these tubes, and forced upward until they make contact in the terminals; the circuit is thus established through the copper rods and the cross-head, around the lower extremity of the barrier, and through the fiber tubes. The cross-head carries a piston, and this piston moves in a long, air dash-pot. To set the circuit-breaker, the rods are forced upward, by means of a wooden rammer, until the contacts are made; in this position the rods are held by a latch, controlled by a solenoid. When the proper amount of current is put through this solenoid the latch is released; a spring starts the rods downward, so that the circuit is broken in both tubes; the gas produced by the arc expels the rods rapidly from the tubes, the acceleration being checked by the dash-pot. This device has been found very effective on the heavy circuits with which we have experimented. It occupies a small amount of space and is simple in its mechanical construction.

Fig. 9 illustrates the construction of a switch or circuit-breaker somewhat similar in principle to that shown in Fig. 8. In this case the terminals are at the lower end and are situated inside of vessels into which the fiber tubes project for a short distance. These vessels are partly filled with oil, the break occurring below its surface. In the switches of this type which we have designed the rods have been withdrawn from the tubes by a pneumatic cylinder. The presence of the oil materially increases the breaking power of the switch and reduces the violence of the explosive effect when the circuit is opened.

Fig. 10 shows a shunt-fuse device that has been used in connection with circuit-breakers at Niagara Falls and elsewhere. The object of the design is to produce a fuse that can be placed in shunt with the circuit-breaker, to open the circuit after the main contacts are broken. It is, of course, desirable so to design such fuses that they can be very easily replaced. The fuse is placed in a slot in a long, wooden rod; this wooden rod is covered by a paper tube, and part of the rod is cut away at three points so as to form air chambers inside of the paper tube. The rod is inserted in a long, wooden tube, provided with vents that come opposite to these air chambers, when the fuse is in place. The fuse is a small copper wire, and is attached to ferrules on the rod which make contact with springs at both ends of the tube. When the current is diverted into the fuse, which immediately volatilizes, the pressure in the chambers bursts the paper opposite the vents and the gas escapes through chimneys provided above the vents. The paper covering of the rod prevents the hot gas from getting into the interior of the tube; consequently the device can be used over and over again without any deterioration. These fuses have worked perfectly in parallel with circuit-breakers under the most difficult conditions that we have yet been able to produce.

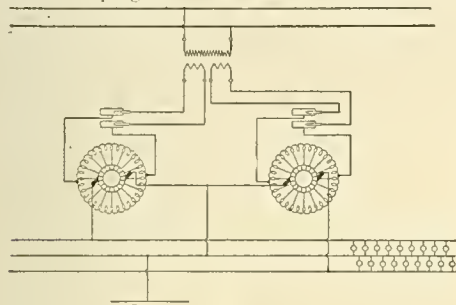


Fig. 6.

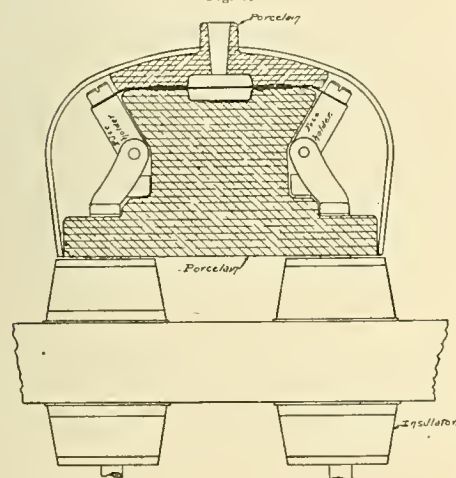


Fig. 7.

MEANS OF ATTAINING SAFETY IN ELECTRICAL DISTRIBUTION.

companies, as well as of users and manufacturers of electrical apparatus, are best served by the introduction of methods which conduce to economy in the broadest sense.

A forcible illustration of the danger of ungrounded secondaries is afforded by a recent occurrence in New Orleans. In a certain residence district, where houses were connected to a system of three-wire alternating mains, a cross caused by wind occurred between one of the main wires and a 2,000-volt primary wire in the same street. The result was that the insulation between wiring and ground was broken down in a large number of houses, the trouble being principally in combination fixtures where conductors were near gas pipes. Fires occurred in 20 houses, and several were totally destroyed, among which were some fine residences. The loss was over \$200,000. If the neutral of this system of mains had been grounded, this trouble could not have occurred.

There is but one condition necessary to safety with a properly grounded secondary; namely, that there be no possibility of the accidental introduction to the secondary system of sufficient primary current to blow the secondary fuses. No possible set of conditions can arise where this precaution cannot be provided, since portions of primary circuits occupying the same streets with secondary mains can easily be protected by fuses if the total primary-current capacity exceeds that of the fuses of the secondary mains in question.

One of the reasons why this subject has not come into prominence before is that systems of alternating secondary mains have not been much used till quite recently, and, consequently, the possibility of crosses between primary and secondary wiring in streets has not existed.

The rule of our underwriters which prohibits the grounding of secondary wiring is not supported by the practice of other countries. I am informed that in England and on the continent secondaries are

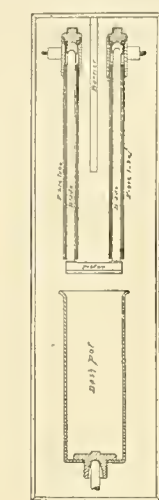


Fig. 8.

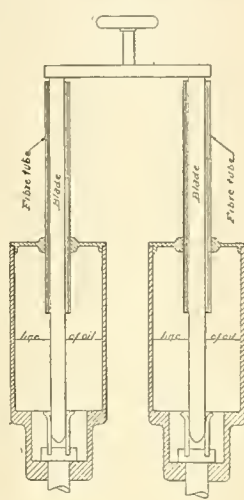


Fig. 9.

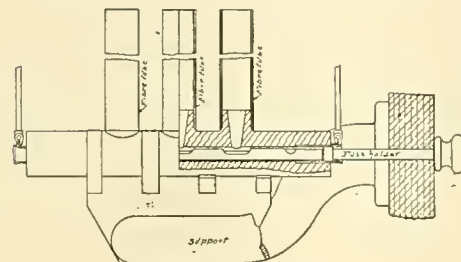


Fig. 10.

of large machines are being run in parallel, and the power that can be delivered at any point is consequently large, and the difficulty of breaking the current that flows in case of short-circuit is correspondingly great.

In the new station of the Metropolitan Railway company about 50,000 kilowatts will be delivered to a single set of bus-bars and from there distributed all over the city. Wherever a sub-station or other installation is connected to these lines, means must be provided by which the circuit can be broken instantly in case a short-circuit occurs. The power of this station is generated and distributed at 6,000 volts, and the loss in lines will be small, so that the violence of a short-circuit in a sub-station will be almost as great as if it were on the main bus-bars.

We have recently done a great deal of work on circuit-opening devices for such heavy duty. One of the principal troubles in such work is the difficulty of making experiments. We have a testing outfit at Mechanicville, with which we can get from 300 to 400 amperes at 15,000 volts with an inductive load, and at Niagara Falls I have tested some devices with 700 amperes and 13,000 volts and a highly inductive load, the voltage rising to 18,000 when the circuit was opened. In comparison with past experiences these conditions seem heavy, but they are light when compared to those which must be met in some plants that are now being installed.

There is, of course, a limit to the capacity of every circuit-opening device, and as power units become enlarged it will be necessary to provide means for limiting the total amount of power that can be delivered to individual branches. This object can be accomplished by inserting reactances in these branches; such reactances can be so proportioned that they do not materially interfere with the normal operating conditions, and, at the same time, they can so limit the total power delivered that it is kept within the safe range of the circuit-opening devices. Up to the present time such reactances



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DEPARTMENTS.

Correspondence, Publications, Trade News, Business, Illustrated Electrical Patent Record.

CONVENTIONS AND EXPOSITIONS.

- International Electrical Exposition in Commemoration of Volta Como, Italy, May 26th to October 25th. American Institute of Electrical Engineers, Boston, June 26th to 29th. American Society of Civil Engineers, Stockton Hotel, Cape May, N. J., June 27th to 30th. Canadian Electrical Association, Hamilton, Ont., June 28th to 30th. Southern Telephone Association, Memphis, Tenn., July 5th. American Association for the Advancement of Science, Columbia, O., Aug. 21st to 25th. National Association of Municipal Electricians, Wilmington, Del., September 5th and 6th. Philadelphia Exposition of American Manufactures for Export, September 10th to November 30th. American Electro-therapeutic Association, Willard's Hotel, Washington, D. C., September 17th to 21st. Chicago Exposition of Electrical Arts, Tattersall's, September 25th to October 9th. International Exhibition of Motor-vehicles, Berlin, Germany, during September. American Street Railway Association, Tattersall's, Chicago, October 15th to 20th.

The Johnson brothers, Tom and Al., are going to England with a view of establishing electric street-railway lines in London and other cities. Tom will probably continue to preach free trade, single tax and government ownership of natural monopolies, while Al. secures franchises and conducts the street-railway business along the usual lines. It's a great combination.

The latest announcement concerning the construction of the British cable in the Pacific indicates that there is a wide difference of opinion between the interests involved. The government of New South Wales has taken the Pacific-cable question up for fresh consideration, and announces that it dissents from the views of the imperial government. It agrees with Canada that the cable should be jointly owned, and not subsidized. This may result in a postponement of the project and prevent the completion of the work until after the American cable to Manila is laid.

The plan of extending the telegraph service into the far North is worthy of careful consideration. Meteorologists in Europe have for many years desired telegraphic connection with Iceland, Faroe Islands and Greenland, and it is pointed out that daily telegraphic reports from Iceland would be of the utmost importance to the weather service of this country as well as to the large fishing interests in the North Atlantic. The British fishing interests have recently petitioned the government to grant a yearly subsidy to the proposed cable. The Danish government looks favorably upon the plan, although it does not believe in government aid. The Great Northern Telegraph company of Copenhagen is willing to construct and operate the cable, provided a certain sum is guaranteed by the governments, corporations and individuals interested. The Royal Danish Meteorological Office in Copenhagen has issued circulars to similar institutions throughout the world, requesting them to subscribe to daily weather bulletins from Iceland and Faroe Islands, and the subject is being seriously considered by other bodies, especially in Great Britain. The attention of the American government has been directed to the project.

It seems that the opinion of the attorney-general and the policy of the War Department have not settled the question of establishing a new cable between this country and Cuba. The present lines are controlled by the Western Union and the West India and Panama Cable companies. When the Commercial Cable company sought the right to lay a cable the government responded that it was without power to consent to the construction of a new line landing in Cuba. As there is no government in the island other than that of the United States, it was thought that there was no power competent to grant the right sought, and would be none until the status of Cuba was determined by developments, and therefore that no new cable line could be constructed for some time. It is said now, however, that the capitalists who are ready to construct the new line are of opinion that if the United States government is without power to consent to the laying of a new cable, it is also without power to prevent the construction of another line to the island; hence, they purpose going ahead with the work, feeling that they can assume risk of the future protection of their property and in the meantime make money. The government might, however, refuse the company permission to land its cable in this country and thus effectually prevent the opening of the new line.

The controversy over the question of extending the trolley system into the down-town district and substituting it on the cable trunk lines is commanding attention among merchants and owners of real estate in Chicago, as well as the street-railway men and members of the City Council. One point that is conceded by all is the need of improved service. The cable lines are now loaded to their utmost capacity, and the demands upon them are constantly growing. The companies must introduce an electric system of some kind, and they are anxious to secure overhead-trolley franchises. The opposition to overhead wires in the business district does not seem to diminish. Every suggestion to introduce

the overhead trolley calls forth a storm of indignant protests. The case of New York is cited to prove that the underground-conduit system is practicable, and all arguments showing that the conditions in the two cities differ widely are unavailing. There is no doubt that the down-town merchants want the electric system extended to all parts of the city, but they are not prepared to give the companies permission to place poles and string wires in the principal streets. It has been proposed as a compromise to grant the companies permission to install a temporary system of overhead trolleys, with the understanding that at the expiration of four years they will put in the underground-conduit system. Such an arrangement, however, would be unsatisfactory to the public and corporations alike.

A great deal of attention has been devoted to the design and construction of the coherer, and much experimental work has been done. Among the more advanced workers in this field is T. Tommasina, who discovered that a sensitive coherer might be constructed by inclosing a drop of mercury in a glass tube between two cylindrical brass electrodes. This fact led him to investigate the properties of liquids with reference to electromagnetic waves. For this purpose he immersed a copper disk and a pendulum bob in distilled water. Both conductors had previously been coated with a film of electrolytic copper and well washed. On passing a current through the two electrodes a black deposit was formed in the disk, which grew until a chain of particles, probably cupric oxide, joined the two electrodes. On increasing the distance between them the current was not interrupted, but the chain grew until it again united both electrodes, even when three centimeters apart. The chain followed the pendulum bob on displacing the latter to the right or to the left, although the chain is sometimes invisible. If a small incandescent lamp is inserted in the circuit, and the bob suddenly removed to three centimeters, the lamp continues to burn even before a visible chain is formed. When the distance between the electrodes is very small, a chain may be formed simply by the action of electromagnetic waves. Tommasina constructed a coherer on that principle, with a very thin layer of distilled water.

Another compliment has been paid the American patent system by English experts who have been engaged upon the problem of preparing a parliamentary bill providing for an effective examination of all applications for patents and a proper registration of those issued by the British Patent Office. The practice in this country has been adopted as a standard, and the recommendations of those who have given much thought to the subject embody the essential features of the American patent system. One English authority declares that the wholesale manner in which patents have been granted without any discrimination in the past has been a disgrace to the British Patent Office, and although patent agents have rendered valuable services to their clients in making searches and giving advice generally, the performance of the work has been difficult, owing to the method of indexing adopted at the Patent Office. It is said that the patents registered in London have not been properly indexed for nearly 20 years, and that for this reason the officials concerned are unable to state whether a patent has been anticipated or not during that period. As a result an English patent has had little value, and has not been accepted as evidence of priority or title to invention. Should the proposed bill be enacted, the result will doubtless be to stimulate the energies of inventors and to induce them to take greater advantage of the facilities afforded by qualified patent agents if they wish to avoid disappointment at the hands of the Patent Office officials at the preliminary stage. The remarkable progress that the United States has made in the industrial arts is attributed largely to the protection afforded inventors under the patent laws, and the wisdom of the course pursued in this country is now universally recognized. In France and Germany, as well as in England, there is a growing demand for an effective patent system based upon the American principles.

Wireless Telegraphy.

In Mr. Preece's lecture before the Society of Arts at London on May 3d he related an interesting incident of the experiments with wireless telegraphy which is worth reproducing here:

When Mr. Marconi was showing the working at the South Foreland to the officials of the postoffice, he received a sharp shock. There was atmospheric electricity about, and Mr. Marconi repeated Franklin's experience. Sharp sparks were elicited from this miniature lightning, and at the same time erratic signals were observable at Boulogne. The speaking to Boulogne was not interfered with. The officers on board H. M. S. Vernon at Portsmouth one day observed similar disturbances, and obtained distinctly the letters A R E. Was this due to Mr. Marconi's experiments at the South Foreland, or was it due to atmospheric electricity? I think the latter, for I have frequently read letters, especially R, on Morse telegraphs when lightning was about.

The question of establishing communication by cable between Halifax, N. S., and Sable Island, which has been under consideration by the Canadian authorities for a long time, has led to a desire that wireless telegraphy be fully tested before the expense of laying a cable is undertaken. It is also proposed to make experiments with the wireless system between shore points and coast lighthouses, with a view to determining its value in connecting points closer together than Sable Island and the Nova Scotia mainland.

The British Admiralty, according to the London Globe, is devoting serious attention to the question of wireless telegraphy. The recent discoveries in that direction are of the utmost importance from a naval point of view, and it is extremely probable that experiments will shortly take place for the purpose of demonstrating to what extent wireless telegraphy can supersede the present methods of signaling by means of flags, semaphore or flashing lamp. In the opinion of some there is no reason whatever why communication between the several ships of a fleet should not be carried on entirely by the new method. The apparatus for transmitting and receiving messages could be fitted up on board any commissioned man-of-war in a few hours. For the purpose of signaling four miles it is only necessary to carry the insulated wire to a height of 20 feet, while to convey a signal to a ship on the horizon the main track of any ordinary vessel would be high enough for the purpose. It is believed that if the masthead of one ship is visible from the masthead of another wireless telegraphy can be carried on between the two without difficulty. The advantages of such a system are, obviously, enormous. All that has to be done by a flagship if she wants to communicate with the whole fleet is for her signalmen to "ring up," beginning with the "general" sign, or with the number of the ship's pennants, as the case may be. No matter whether it be night or day, clear weather or thick, the signal will pass from one ship to another with absolute ease. In a fog, too, communication will be as easy as on a clear day. It may be said that such a system in war time would be too dangerous, by reason of the risk of an enemy's ship "picking up" the signal. A moment's consideration, however, will show that there is no more danger in telegraphing a secret code than there is in signaling one by means of flags. Experiments are being made to perfect a method of sending wireless messages to one exclusive point by means of certain adjustments on the transmitting and receiving instruments. If successful, wireless telegraphy will in time entirely revolutionize the whole system of signaling in the navy.

The San Francisco Examiner reports some interesting experiments in wireless telegraphy at the Jesuit College in that city. The Rev. R. H. Bell, who conducted the experiments, is reported to have made the following deductions from his own investigations and the reports of others: "It is now certain that the Marconi coherer is not the only apparatus destined to play a part in the receivers of wireless telegraphy. From considerations on the constitution of matter, and from experiments, it seems clear to my mind that the whole phenomenon exhibited in the transmission of wireless messages is due to rapidly effected static induction waves."

Cost of Chicago's Street Lamps.

[From the Chicago Tribune.]

The municipal department of electricity reports that the average expense of maintaining a city arc light last year was \$68.52, and that the cost for 1899 will not exceed \$60, and may fall to \$55. That item of \$68.52 is made up of station expenses, salaries and "improvements to the system," the latter amounting to about three dollars per light. The cost of operating expenses in Detroit last year was \$51.85 per lamp. There were 300 less lamps here than there, but making allowance for the economies which can be made when doing business on a more extensive scale, the Detroit electrical department makes a better showing than the Chicago department does. It is also more business-like in its way of keeping accounts. It charges \$11.70 against each lamp on account of depreciation of plant. The Chicago department makes no such charge, although admitting that its plant will give excellent and economical service for only about 15 years. Nor does the Chicago department make any charge on account of interest on money invested in the plant. In a word, it does not keep its accounts in such a way as to show the actual cost of the light it is furnishing. The cost is understated, so as to make out a good case for mu-

nicipal management of the business. The department should keep its accounts in a business-like manner. Then it will be possible to tell whether it is saving money for the city or losing it.

Detroit Street-railway Ownership.

[Correspondence of the Western Electrician.]

Detroit, May 29.—The commissioners appointed to purchase the Johnson street-railway electric system of Detroit have made their report. No action will be taken by the Common Council until the result of the Supreme Court decision in the McLeod bill is announced. This bill, it will be recalled, is the special enabling act, hastily passed by the Legislature, in order that the deal with Johnson might be carried through.

The actual physical property was first carefully looked over and valued, at a fair estimate, at \$7,808,737.42. The street-railway company insisted that this amount was \$1,000,000 too low. After a thorough review of the claims of the company, the report reads: "For the purpose of our investigation, we fixed the value at \$8,000,000, in round numbers." After explaining that the words "franchise value" in the report mean the aggregate of profits that would be realized during the lives of the several franchises, reduced to present worth, the commission declares that operating expenses and interest on the physical property should be deducted from the earnings. The net earnings, as divulged by the railway company, in confidence, for the year ended April 1, 1899, were \$805,000, but from this amount Professor Bemis, the expert selected by the city and railway company, deducted \$55,000, to cover possible, if not probable, increase in operating expenses, etc. The report then continues: "Professor Bemis' computation is made on a basis of \$750,000 net earnings, deducting four per cent. on \$8,000,000, the value of the physical plant, and allowing four per cent. annual increase in income through increased traffic and earnings through the lives of the franchises. This franchise value, viz., \$8,478,563.86, added to the value of the physical plant, viz., \$8,000,000, makes the total value of the street-railway property and franchise rights \$16,478,563.86."

The report points out that the street-railway people objected to this computation on the ground that the allowance was made of only four per cent. for annual increase of business, whereas the gross earnings have for several years past increased at the rate of 6.3 per cent. per year. The company pointed out that if the last five years of the lives of the franchises were considered—the full term yet to run is about 17 years—the increase would be about eight per cent., counting on the approximate increase in population of Detroit for the period in question.

The company also objected, the report says, to Professor Bemis' arbitrary deduction of \$55,000 a year on the net earnings, claiming that this meant an aggregate loss of at least \$1,000,000 in the actual value of the franchises. In answer to the company, the commissioners, according to the report, justified their recognition of an increase of only four per cent. in business per year, whereas it had been actually 6.3, on the ground that if the city took control there should be some margin to allow for the introduction of three-cent fares. The report continues, in part:

"The railway owners insisted on demanding \$17,500,000, secured by blanket mortgage on the plant. We have strenuously endeavored to secure concessions in price, but succeeded in the following only: The company offered to turn over \$400,000 in bonds and \$300,000 additional, or \$700,000 in all, as a sinking fund for the city to assist in meeting future interest charges, thus reducing the price to \$16,800,000. We feel warranted in saying that no better price could be secured.

"The interest on \$16,800,000 is \$672,000. The sinking-fund provision for the first four years is \$50,000 a year, making a total fixed charge of \$722,000 annually, a sum \$83,000 below the net earnings as shown for the past year, and \$83,000 below such net earnings after making the deductions referred to for increased operating expenses, etc.

"If no increase in the earnings were made for 12 years to come, the present rate of earnings would still provide safely for meeting the entire bonded indebtedness, and the largest sum that will be required at any time, commencing approximately 25 years hence, would represent but \$122,000 more than the net earnings of last year, an amount that would be largely made up by having all deadhead tickets withdrawn and having everyone pay his fare on the new basis."

It is asserted that the reduction of fares from five to three cents will in itself save citizens from \$500,000 to \$800,000 a year. The report concludes with the suggestion that before the deal is closed or action taken by the Common Council, the whole matter be first decided affirmatively at a special city election.

Since the report was made public a new plan has been evolved. It is to leave the purchase price in the bonds at the figure practically agreed upon, \$16,800,000, sell only such amounts of the bonds as are necessary to secure the cash needed, and have the balance of the bonds to be available in case the universal three-cent rate does not prove a paying investment. However, many are opposed to the purchase altogether, owing to the great indebtedness involved.

Pan-American Exposition.

By a vote of 17 to four the directors of the Pan-American Exposition company have selected what is known as the Kumey site as the point for holding the proposed exposition of 1901 in Buffalo. The site includes 291 acres belonging to private owners and 145 acres belonging to the park system of Buffalo. It is estimated that the total cost of the site for the purpose of the exposition will be about \$200,000. Many persons regret that the company did not locate the exposition on the Niagara frontier, as the site selected is without any water front.

The preliminary prospectus of the exposition has been issued, and makes this reference to the proposed use of Niagara power: "The exposition site is within 40 minutes' ride of the Falls of Niagara, which can be reached by steamboats and by steam and electric cars. That majestic panorama of the wonders of nature, which is visited by millions of people every year, is well worth the journey across the continent or sea. This age of electricity will be signalized for the first time at an international exposition by the exclusive use of electrical power, which will be generated by the energy of that great cataract, carried over cables to the exposition grounds. Whatever the world now knows, whatever it may know in 1901, of the mysteries of electric fluid will be developed and illustrated with a fullness and beauty that only the power of Niagara could make possible. The street cars of Buffalo are propelled and its streets are lighted by electricity generated at Niagara Falls, and it is believed that all the industries of that city, which employ 70,000 mechanical and manufacturing hands and a capital of \$100,000,000, will be moved by the same subtle and mysterious force."

The New England Street-railway Consolidation.

[From the Boston correspondent of the Western Electrician.]

The name of the big combination of railways in Massachusetts and adjacent states has been decided upon. It will be known as the Massachusetts Electric companies. There are 33 companies in the combination. The position of general manager has been tendered to P. F. Sullivan, heretofore manager of the Lowell and Suburban railway, which is one of the plants absorbed in the deal. Mr. Sullivan will accept. He is president of the Street Railway association of New England, has been to Europe twice on inspection tours, grew up in the street-railway business, and is thoroughly equipped for the duties of his new and important position. His management will extend over 700 miles of trackage. During the past year the companies in the consolidation carried 69,767,439 passengers, employing 2,200 men and operating 1,240 cars. Concentration of power and power houses and other savings in operation are expected to increase the earnings materially. The office of the companies will be in Boston, and temporary quarters have been secured for Manager Sullivan at 8 Congress street. There will be four divisions, each under a sub-manager, responsible to the chief. E. F. Foster, now manager for the Lynn and Boston system, and R. S. Goff, manager of the Brockton system, are slated for two of these divisions.

Electric Railways in the Netherlands.

United States Consul Listoe at Rotterdam gives some information concerning the electric-railway industry in the Netherlands in an official communication to the State Department. He says that at the time of writing, April 6th, there were only two electrically-operated railway systems in the Netherlands—the road from Vaals to the German frontier, under the management of the Aachener Kleinbahn Gesellschaft, a little over half a mile in length, and the line from the Hague to Scheveningen, something over six miles. The cars on the latter, he says, carry their own motors [probably meaning storage batteries], as the trolley system is not allowed. "Concessions of franchises must be obtained from the city governments, and from the state when public highways are to be occupied. Some municipalities—Rotterdam, for instance—seem to be prejudiced against the electric system; in others, however, concessions could doubtless be readily obtained. On the island of Walcheren the project of building an electric line from Flushing or Middelburg to Domburg and Vere has long been agitated; but things move slowly in this country, and there would probably be a good opening for enterprise. People here have great respect for American energy." The field, however, should be personally inspected, he adds.

The X-ray in Dentistry.

Among the later applications of the X-ray is its use as a help in dental surgery. Many cases occur in every dentist's practice where skiagraphs of the jaws would be a valuable aid. The subject was discussed at the recent meeting of the Illinois State Dental Society in Chicago. At a clinic in the Northwestern Dental College Mr. W. C. Fuchs made a practical demonstration of the application of the X-ray in dentistry before a large number of spectators. The dentists were greatly interested and impressed.

DEVELOPMENT OF THE TELEPHONE FIELD.

Telephone News from the Northwest.

[From the Minneapolis correspondent of the Western Electrician.]

The Board of Aldermen of St. Paul has passed an ordinance granting the American Telephone and Telegraph company a franchise for long-distance and local-exchange connections.

The announcement is made from Milwaukee that the Wisconsin Telephone company, operating the Bell system in that state, has passed into the hands of the Erie syndicate, and it is understood Wisconsin, Minnesota, North and South Dakota will now be under one management. Just what the change may indicate is unknown, but it is supposed that a more vigorous campaign will henceforth be made in Wisconsin, where the company has had the same kind of troubles as in the other states, viz., aggressive and growing independent exchanges in every town of any size.

The People's Telephone company of Waupun, Wis., will extend its lines to Randolph and Fox Lake, Wis.

The Wassau (Wis.) Telephone company has let the contract to the American Electric Telephone company of Chicago for a new improved switch-board.

Following the lead of Polk and Clinton counties, the county assessor will assess telephone and telegraph companies at Fort Dodge, Ia.

The application of the Wright County Telephone company at Clarion, Ia., for a telephone franchise was voted down.

The Gilmore City (Ia.) Telephone company has begun work installing an exchange.

The Citizens' Telephone exchange of Montevideo, Minn., has been incorporated, with \$10,000 capital stock.

The Waseca (Minn.) Telephone company will hereafter give continuous service on Sunday, instead of a few hours, as heretofore.

Negotiations have been completed for the sale of the Home Telephone company's system in Sioux City, Ia., and elsewhere to F. L. Eaton, T. H. Johnson, R. M. Dott and F. W. Lohr. Out of the re-organization will result a rich and powerful company, which, according to report, will make a formidable rival to the Bell company. The Home company has an exchange at Sioux City, Ia., an exchange at Vermillion, S. D., and 225 miles of toll wire. Alliances will be made with all the independent companies in its vicinity.

The Interstate Telephone company will establish an exchange at Appleton, Minn.

The telephone company at Bancroft, Ia., has made free service from that place to Swea City, Ledyard, Germania and Buffalo Center. The reason for this is unknown, but it is supposed to be directed against the new line to be put in by the Germania Telephone company.

The Winona (Minn.) Telephone company will order a 1,200-drop switchboard, to cost about \$3,000.

The Central Telephone company of Des Moines, Ia., has been granted a franchise for a telephone exchange at Pella, Ia.

The instruments of the Iowa Telephone company have been replaced in the court house at Sioux City, Ia. They were ordered out by the county supervisors a few months ago.

The La Crosse Telephone company now has 35 patrons in Onalaska, Wis., and finds it necessary to enlarge the switchboard.

The town of Hawarden, Ia., has proposed to put in a municipal telephone exchange, but is compelled to refrain, as the laws of Iowa do not authorize the municipalities to engage in the telephone business.

A telephone line has been completed between Manitowoc, Wis., and Francis Creek.

The New Ulm (Minn.) Telephone company has sold all its outside lines to the Minnesota Central Telephone company.

The Mississippi Valley Telephone company has been contesting with Judge Giffillan in Minneapolis for the right to plant a telephone pole in front of the judge's property. The judge won, but not until after an encounter with the workmen. The council changed the ordinance to bring the disputed point within the underground district, and policemen stood guard day and night to see that no pole was put up during the passage of the ordinance and the time of its going into effect.

The People's Telephone company of Superior, Wis., has increased its capital stock from \$50,000 to \$100,000, and will soon start work on the new exchange. The same company is preparing to begin work at once on the exchange in Duluth.

Kulm, N. D., is to have long-distance telephone connection soon.

MANUFACTURERS AND DEALERS.

The Central Telephone and Electric company of St. Louis reports that its business during the last few months has been the best in the history of the company. President James S. Cuming has built up an excellent trade, and as the company endeavors to be up to date in all its products, the Central company is bound to receive its share of the telephone business.

Novel Telephone Litigation.

[Special correspondence of the Western Electrician.]

Detroit, May 27.—A unique telephone case is attracting interest at Ann Arbor, Mich. N. B. Trimm held a chattel mortgage on the goods of P. W. Shute, a hotel proprietor of Ypsilanti. Perrine and Cramer, witnesses, claim to have overheard a telephone conversation between Shute and his wife on the long-distance line of the New State Telephone company. It is claimed Shute was in Detroit and directed his wife over the wire to have the goods in question ready at 11 o'clock at night, as two vans would come from Detroit to take them away. Trimm heard of the plan in a round-about way and took legal steps to protect his interests. Shute then sued Trimm on the charge of slander. The judge took the case from the jury and directed a verdict for the defendant.

Shute now sues the telephone company for \$10,000 damages, alleging, first, that the stories of Perrine and Cramer were false, and, secondly, that even if they were true, the message should have been held inviolable by the company and that secrecy should be strictly observed, according to the provisions in the company's charter for the protection of private business entrusted to telephone agents. The telephone company has answered that Perrine and Cramer did not represent the company, whatever might have been their stories. But the company goes farther and alleges that the statements overheard and reported by Perrine and Cramer were justifiable if used to prevent the commission of a crime; that while the purpose of the company is to aid in the speedy transaction of public business, its lines cannot be made use of to plan crime or commit fraud, and, finally, that it is under no obligation to keep secret the conversations of criminals who use the telephone service. G.

Finances of Central Union Telephone Company.

[From the Economist, Chicago.]

The recent strength of the stock, in the face of the fact that no dividend is to be expected this year, is explained by a very remarkable growth of late in the company's business. The increase in the number of subscribers thus far indicates that the company will put 15,000 additional instruments in use this year, bringing the total number by the end of the year up to 60,000. This will be an increase of 33 per cent. this year and will make an increase of 100 per cent. in four years. Gross receipts, of course, do not increase in the same ratio, the tendency in this as in other lines being toward a larger volume of business with a smaller unit of profit. The company will spend about \$1,000,000 on construction this year, if it can get the materials required. This will be the largest amount spent in one year on that account. Construction expenditures, with the increased number of instruments, have been as follows, including the above estimate for 1899:

	Spent for Construction.	Inc. in No. Inst.
1896	\$ 688,602	2,011
1897	802,192	4,667
1898	888,748	8,875
1899	1,000,000	15,000

In addition to the above expenditures it has been the policy of the company to make liberal charges for maintenance of plant. In 1898 \$480,000, and in 1897 \$360,000, was expended for that purpose and charged to operating expenses.

NEW COMPANIES.

The Western Automatic Telephone Exchange company of San Francisco has been incorporated by Archie Borland, Oakland; S. Calhoun, Andrew White, John H. Miller and A. C. Aiken of San Francisco.

The Antiseptic Mouthpiece company has been incorporated with \$100,000 capital stock. The purpose is to make mouthpieces for telephones. The officers are: President, Charles W. Hutchings of Boston; clerk, William M. Bradley; treasurer, Gideon M. Mansfield of Boston.

The Pendleton Telephone company is a new corporation with a capital stock of \$8,000. The incorporators are R. W. Fletcher, W. J. Furnish and J. Despain. The company will operate and construct telephone systems in the state of Oregon. A line will be extended from Pendleton to Long Creek, 100 miles south of Pendleton.

PERSONAL.

E. G. Drew has been appointed purchasing and supply agent of the Chicago Telephone company, to succeed J. C. Kenny, resigned.

Alfred A. Beamer, manager of the Michigan Telephone company at Lansing since 1880, has resigned and will be succeeded by John H. Lyons of Detroit.

A dinner was given in Young's Hotel, Boston,

May 23d, in honor of Heman J. Pettengill, by his friends. He retires from the superintendency of the Eastern division of the Postal Telegraph-cable company to take the position of vice-president of the Erie Telephone company.

At the meeting of the Mexican Telephone company's directors, held in Boston, May 17th, Ezra H. Baker resigned and Godfrey Morse was chosen as his successor. The officers of the company, with this exception, were re-elected.

Telephone Progress in the South.

Albany, Tenn., will soon have a telephone exchange.

The new telephone line from Lexington, N. C., to Thomasville is finished.

Porter Springs and Dahlonga, Ga., will be connected by telephone within 60 days.

The Gainesboro Telephone company is putting in an exchange at Crossville, Tenn.

L. Hill & Son of Pittsburg, Texas, will soon establish a telephone exchange at Smithville, Texas.

A local company will build a telephone line from McKee, in Jackson County, Ky., to Richmond, Ky., 25 miles.

Lufkin, Texas, will soon have telephone communication with Nacogdoches and with Conroe via Cleveland.

The Cumberland Telephone and Telegraph company is completing a line from Cornersville to Ostell, Tenn.

The new telephone line, connecting Lexington, Tenn., with Decaturville and all intervening points is completed.

Plans for the Southwestern Telegraph and Telephone company's building to be erected at Austin, Texas, have been completed.

The telephone line between Parsons and Lexington, Tenn., is finished, and an extension from the former town to Perryville is under way.

The Southwestern Telegraph and Telephone company's new long-distance telephone line from Longview to Houston is rapidly nearing completion.

R. L. Durett is about ready to begin the work of construction of his telephone exchange for San Marcos, Texas. Nearly 100 subscribers have been secured.

Telephone connections between Linville, Tenn., and Fry, Hickman, Yokely and Brown's Distillery have been completed by the Cumberland Telephone and Telegraph company.

The Lowell and Greenbrier Valley Telephone company, chartered by J. H. Miller of Hinton, W. Va., and others, will operate a line from Hinton via Wiggins, Talcott, Lowell, Stock Yards and Wolf Creek, to Alderson.

The McMinnville (Tenn.) Telephone company has bought the Smithville Telephone company's line from Smithville to Dibrell via Sulphur Springs, and is extending it to McMinnville.

The Interstate Telephone company has bought the Elmira Telephone company's line, from Raleigh via Selma, Smithfield, Dunn, Princeton and Clayton, to Goldsboro, and is building a line from Goldsboro to Wilinston and another from Raleigh to Greensboro, via Durham.

An ordinance has been passed in the City Council of Waco confining the two operating telephone companies of that city, Southwestern and Independent, to six feet of perpendicular space on their poles for stringing wires, and to 40 wires to the pole. The independent company is putting its wires underground in certain limits, but there seems to be a disposition to compel both companies to put their wires underground within the fire limits of the city.

The Blue Ridge and East Texas Telephone company is a new organization that is building a telephone line throughout Collin County, in the northern portion of the state. This company has completed its line from Leonard, Fannin County, to McKinney, quite a city of Collin County, where it connects with both the long-distance and local telephone systems. It passes through the following Collin County villages: Kuox, Pike, Blue Ridge, Valdosta, Chambliss and Melissa.

The Southwestern Telegraph and Telephone company has recently made a change in the organization for the state of Texas. Superintendents E. K. Baker and J. A. Farnsworth, of Austin and Dallas respectively, have been promoted to the office of general manager of the southern and the northern districts, created for them. A. E. Jeavons of Houston has been selected as the general superintendent of the southern district. Mr. Tom Milburn of Dallas is the new general superintendent for the northern district.

The Marion (Va.) telephone exchange, which has been in operation about five years, has been sold to the Pulaski Telephone company, of which D. D. Hull, Jr., is president. The latter company has a successful exchange at Pulaski, Va., is building a system at Radford, is preparing to build at Wytheville, and is negotiating for the purchase of an exchange at Abingdon. It proposes to run them all under one management, and will at once connect all the towns with a through line from Bristol to Radford, and extend the line to Roanoke east and Bigstone Gap west, a total distance of over 200 miles.

Underground Distribution of Two-phase Current in New York.

[Continued from page 311.]

tached to the test bus, and from the center of this switch a lead is carried through the primary of a transformer which has a red lamp connected across its secondary; then through the amperemeter to the diagonally opposite outside poles of a double-throw, double-pole switch (B); from the other outside poles a wire is carried to ground. Current is supplied to the center connections of this switch by a small direct-current, shunt-wound generator having a capacity of about 10 amperes at 250 volts, and by means of this reversing switch the current can be sent through the circuit in either direction. In locating trouble the direct-current generator, which is belted to a five horse power motor, is started and the single-throw switch (B) thrown on either side of the bus. If the red lamp lights up, it indicates that the ground is on the other leg, and the switch is thrown over. The direct current is then brought up to about seven amperes and the reversing switch (B) is thrown about every 15 seconds, which reverses the direction of the direct current flowing through the cable to the ground. The subway workmen then start out with a compass and go to a manhole through which the circuit in question passes. If, on laying the compass on the cable, the needle reverses every 15 seconds, they know the ground is farther from the station; if, however, the needle is not affected every 15 seconds, it indicates that the trouble is between the manhole opened and the station, and they then open another manhole nearer the station. In this way they are able, without cutting the cables, to locate the trouble in a section between two manholes or handholes, or possibly in a manhole; whereas, prior to the use of this device, we were frequently obliged to cut in 15 or 20 places before locating the fault. In some cases, if the trouble is slight, we are able to repair it without shutting down the circuit, as the men are provided with rubber boots and rubber gloves drawn on over buckskin gloves, and an insulated box to stand upon, and can safely and quickly make a temporary joint that will answer every purpose until such time, say early the next morning, as the circuit can be shut down without detriment to the customers. If, however, the trouble is extensive, the circuit is shut down at once and the repair made as promptly as circumstances permit. Unfortunately, however, the subway company objects to the circuit being run, even on an independent generator, while we are locating the trouble, and therefore we now pull the circuit at once and make the test in the same way, except that we use two compasses, as the direct current flows through the primaries of the transformers and tends to mislead the men if they use but one. A compass is placed on each cable, and as long as both needles are similarly affected they know that the trouble is beyond them; when, however, the needles tend to point in opposite directions, they know that they have passed the trouble and its location is then easily determined.

It is, perhaps, curious to note that when the alternating current is on the circuit the direct current apparently does not flow through the primaries of the transformers. Trouble on series arc circuits is also located in this way, except that not more than about four amperes of current is used, because otherwise the cut-out magnets tend to act and throw the regular lamp magnets in circuit, the resistance of which practically stops the flow of the current.

TESTING FOR INSULATION RESISTANCE ON LIVE CIRCUITS.

It often happens in running a large number of circuits from a common bus that phenomena will arise that have a suspicious look and make it desirable to find out which particular circuit or circuits has caused the disturbance. It would have been disastrous to the money-making end of the business if every time something unusual manifested itself we had made a practice of pulling circuit after circuit until the delinquent had been detected, and it therefore became desirable to be able to make reliable insulation tests while the circuits were in actual operation. In order to accomplish this an arrangement of apparatus was devised, such as is shown in Fig. 3, and which is described as follows:

A spare generator is started and connected through its switches to the test bus. From this bus a line is carried through a high-tension switch and then through the primary coils of four transformers in series, the secondaries being left open, as shown in the diagram. This line is then carried through the galvanometer, which is provided with the usual short-circuiting key and shunt; thence it goes to a battery of 100 chloride cells equipped with reversing key, and from thence to earth. The transformers used are of the ordinary 2,000-volt type (which is the pressure used on the system), and are of about two-kilowatt capacity each, which we have found by experience to be about the right size. The coils being in series, they offer very high inductive resistance to the passage of alternating current, but their resistance is practically nothing when measuring megohms with direct current.

In making the test we first ascertain the insulation resistance of the generator, test bus, leads, etc. The circuit is then thrown on the test bus and tested in the same manner as if it were not connected to a high-tension generator, with the excep-

tion that it is not necessary to allow any time for charging or discharging the cable. This is called a "hot" test. The results are the same on testing either leg of the circuit, and the insulation resistance is generally found to be anywhere from 15 per cent. to 75 per cent. lower when tested "hot" than when the circuit is disconnected from the generator and tested in the ordinary way, that is; "cold," although the lower the insulation of the circuit, the closer the two tests appear to agree. For instance, recent tests on five circuits gave the following:

Circuit No. 21—Hot,	.693 Megohms.	Cold,	.83 Megohms.
" " 25—	.519 "	" "	1.31 "
" " 27—	.975 "	" "	1.39 "
" " 29—	1.95 "	" "	2.44 "
" " 16—	4.75 "	" "	10.25 "

When this device was first put into service, and we had convinced ourselves that the readings obtained were really useful, we became impressed with the idea that perhaps we might be able to note the actual effect of the strain of the pressure upon the insulating material surrounding the conductors, and to this end a special set of tests was made, with the following results:

Length of circuit, 4.36 miles.
First test, all converters in (22): Hot, 4.39 megohms total. Cold, 12.94 megohms total.
Second test, all converters out: Hot, 7.56 megohms total. Cold, 28.55 megohms total.
Third test, all converters out except one mounted on glass insulators: Hot, 7.56 megohms total. Cold, 26.4 megohms total.
Fourth test, all converters in after ends had been paraffined: Hot, 4.28 megohms total. Cold, 16.6 megohms total.

While these results are admittedly too indefinite to be regarded as at all conclusive, they nevertheless point to the fact that the insulation of a circuit does depreciate, for the time being, while under the influence of high potentials.

TELEPHONE IN UNDERGROUND TESTING.

It has been found by experience that underground circuits, particularly those employed for series arc lighting, need periodical overhauling, otherwise weak spots will accumulate to such an extent as to bring down the total insulation resistance below the standard requirements. At such times a great many galvanometer tests are necessary, and it was found that the work could be done much more quickly if the galvanometer were set up in the station instead of being moved from place to place along the street. The great objection to this, however, was the necessity for frequent communication between the foreman of the subway gang and the tester in charge of the galvanometer, obliging the former to use the public telephones a great many times during the day, which was decidedly inconvenient and involved much loss of valuable time. To overcome this serious objection, Mr. Sparrow and his assistant, L. A. Jenkins, caused to be constructed a special telephone set for use on underground cables, which works very satisfactorily.

The magnetos, instead of being wound, as ordinarily, for 10,000 ohms, are wound to ring through 50,000 ohms, and a battery is placed inside of the magneto-box, the transformer and receiver being mounted on a separate L-shaped piece connected by a flexible cord to the magneto-box. The impedance of the series arc circuits, when used for telephoning, is very great, owing to the capacity of the rubber-covered, lead-sheathed cable, and, in order to talk successfully, it was found necessary to use condensers in connection with both telephones. With their use we are able to hold conversation over our longest series arc circuit, which is 12 miles underground and three miles overhead, and contains 65 lamps. The method is very simple, as may be seen from the accompanying Fig. 4. The telephone at the station end, except at time of test, is left constantly in circuit. When the subway foreman has completed his arrangements he connects his telephone, one wire to the copper of the cable and the other to the lead sheath, calls up the tester and so advises him. The foreman then disconnects his 'phone, and the tester does likewise, at the same time switching in his galvanometer. The latter then makes his test and throws his telephone back into circuit. After the lapse of three minutes the foreman also reconnects his telephone and calls up to know the result of the test and get further instructions. In this way the work of overhauling and renovating is very much facilitated, and the cost of maintenance and repair sensibly reduced.

The other large company distributing two-phase current in this city uses Westinghouse apparatus, and, if I am correctly informed, a variation of the Mershon system of distribution, which is somewhat different from the system just considered. The generators are of the two-phase type, with "star" connection, and generate a potential of 25 times the voltage used on the lamp.

The generator leads, of which there are four, are carried through double-throw switches to the bus-bars, and from these the feeders are taken, as is shown in Fig. 5. The feeders consist of three wires, two being taken from one phase—the red, for instance—and the third, of smaller size, the so-called "power wire," is taken from one of the bus-bars of the other or black phase. Therefore, on this feeder (No. 1) the lighting is carried on the red phase and the power taken from both; on the next feeder (No. 2) the lighting is taken from the black phase and the power from both. In this manner the feeders are balanced between the two sets of bus-bars, so that the load is evenly distributed on the generators.

A large part of the distribution, instead of being

made from house-to-house transformers, is accomplished by two large transformers being placed in the vaults or basements of the larger customers, and secondary mains run out from these places to the surrounding installations, as shown on secondary mains, No. 1. The larger of these two transformers carries the lighting load, and is wound with a ratio of 25 to two, the primary wires being connected to the cables of one phase and the secondary to the two heavy distributing cables, having a potential difference of 220 volts. The other or smaller transformer is wound with a ratio of 25 to four. One of its primary wires is connected to the so-called "power wire" and the other to the center of the primary of the lighting transformer. One of its secondary wires is connected to the secondary "power wire," and the other to one of the secondary lighting wires. You will therefore see that the difference of potential between the secondary leads of this transformer is 220 volts, and that the resultant pressure between the "power wire" and the other lighting cable is 310 volts.

Where incandescents and arc lighting only are required the two lighting cables are carried into the installations and an economy coil placed at the service to divide the pressure into two equal pressures of 110 volts each. Two sizes of coils are used, one of large and special design for theater work and the other for ordinary installations. The leakage loss on the latter varies from .1 to .5 ampere at 200 volts, which goes on during the 24 hours of the day. This probably offsets the saving of leakage loss due to the use of large transformers in sub-stations, instead of a greater number of small transformers, as in the house-to-house system. Where arc lights only are required, the 220-volt wires are carried direct to the lamp and an economy coil used having a ratio of 220 to 32. Where motors are required, the "power wire" is also brought in and the motor connected on the three wires as shown, although, as a rule, motor customers' premises are used as transformer sub-stations.

In conclusion, I desire to say that both methods are capable of good work, and, so far as cost of operation is concerned, there is under the existing circumstances but little difference, I think, between the two. It is undoubtedly true, however, that in the matter of power service the Mershon method has a distinct advantage in operating elevator motors of large size, because the primary current is taken, one-half from the lighting circuits and the remainder from the "power wire," whereas in the other method it is taken entirely from the lighting circuits, and the heavy inrush currents at the time the motors start vary the pressure and sometimes produce disagreeable effects upon the lighting, particularly in localities where the copper is scant.

As compared with single-phase distribution, I should say that either of the two-phase systems here described was superior in two important particulars, viz., in the matter of providing a second service, as before stated, and in operating elevator motors. The latter point is one of very great importance, as you will appreciate when I say that in New York city there are installed upward of 15,000 horse power in elevator motors alone, which yield annually a revenue far in excess of what might generally be supposed.

Municipal Electricians at Wilmington.

The National Association of Municipal Electricians will hold its annual convention in Wilmington, Del., on September 5th and 6th. It is expected that delegates will be present from 100 to 150 cities of the United States and Canada. During the convention papers will be read by the following-named gentlemen: Thomas Flood, commissioner of Wire Department, Boston; M. W. Mead, city electrician, Pittsburg; George F. MacDonald, superintendent of fire telegraph, Ottawa, Canada; S. D. Wheeler, superintendent fire telegraph, Springfield; W. H. Thompson, superintendent of fire telegraph, Richmond; Captain William Brophy, chief electrician, Boston; John Weigel, superintendent of police telegraph, Boston.

Jonathan W. Aydon of Wilmington, the president of the association, has secured the Pyle Cycle Academy, where an electrical exhibition will be held during the entire week, September 4th to 9th, inclusive. The following-named concerns have taken space: Frederick Pearce, New York; Okonite company, New York; M. & I. Electric company, New York; Kerite company, New York; Gamewell Fire-alarm company, New York; Standard Underground Cable company, Pittsburg; Habirshaw Wire company, New York; F. M. Ferrin, Boston; J. S. Wilson, Boston; Shelby Electric company, Shelby, O.; Montauk Multiphase Cable company, New York; Wilmington City Electric company, Wilmington, Del.; Columbia Phonograph company, New York; Electric Carriage Automobile company, Philadelphia; Kings County Electric Equipment company, Brooklyn.

The Gardner, Westminster and Fitchburg Street Railway company has been incorporated under the laws of Massachusetts at Fitchburg, Mass., and will construct a road 10 miles long. The route will be from Gardner to Fitchburg, with a connecting link to Wachusett Lake. The officers are: President, F. S. Coolidge; vice-president, E. F. Blodgett; clerk and treasurer, J. F. Stiles of Gardner. It is expected that the line will be in operation by July 1st.

"Diamond H" Push-button Switches.

It would seem that the demand for push-button switches has been more than satisfied by the various types upon the market, and that very little improvement could be made in switches of this class. Like many other articles of manufacture in the electrical line, improvement can be looked for only in details, but the manufacturer who makes the most successful combination of improved details will have an article which will command a ready market. The "Diamond H" line of push-button switches, herewith illustrated, is said to have many points of merit. It has been the aim of the manufacturer of this line to answer objections made in the past by engineers, wiremen and others against the various modifications of this general type of

laminated, and held together by a central bushing. This spool is shown in section in Fig. 5. It is loosely mounted in an elongated opening in the switch plate, and is driven by a pin through its central opening. The body of the spool is surrounded by a steel sleeve, thus preventing the edges of the opening in the switch plate from cutting the mica. Mica, being a practically perfect insulator, a non-absorbent of moisture and unaffected by changes of temperature, is by far the best material that can be used for this purpose. The movement of the buttons is smooth, and the pressure required is uniform throughout their travel, and nothing else has been sacrificed to secure this end. Details of less importance than those referred to have been carefully considered, and the result is a switch

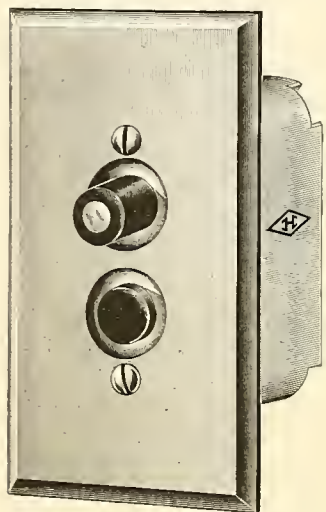


Fig. 1.

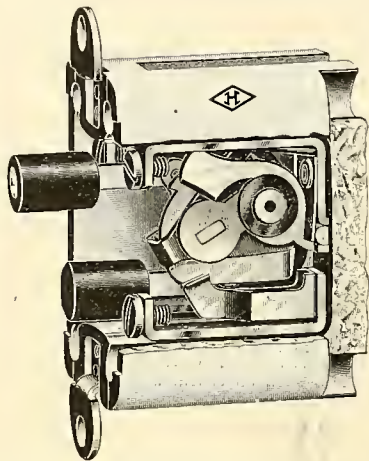


Fig. 2.

"DIAMOND H" PUSH-BUTTON SWITCHES.



Fig. 3.



Fig. 4.



Fig. 5.

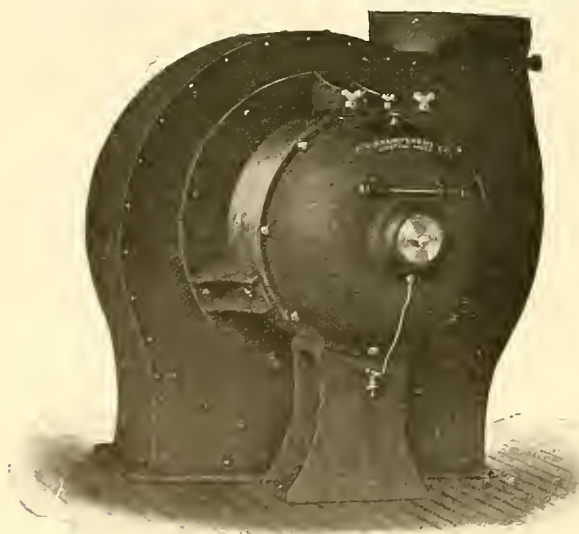
switch. The main points that have been considered in the construction of this switch are: First, positive mechanism and good contacts, with good wearing qualities of both; second, perfect insulation of the current-carrying parts, both between the terminals and from the other metal portions of the switch; third, ease and uniformity of movement and simplicity of mechanism.

A few details of construction will be of interest to those whose experience with switches of this type has not been entirely satisfactory. Fig. 1 shows the switch as a whole, with a solid-brass face-plate.

which the manufacturer, the Hart Manufacturing company, believes to be thoroughly good and reliable.

Steel-plate Electric Fan with Enclosed Motor.

One of the greatest difficulties in employing an electric fan under certain conditions lies in the prevalence of dust in the atmosphere, which would ultimately injure or derange the motor. To obviate this difficulty a special type of fan, with enclosed



STEEL-PLATE ELECTRIC FAN WITH ENCLOSED MOTOR.

The ears for attaching the switch to the wall or woodwork are recessed in the back of the face-plate, avoiding the necessity of cutting a recess in the wall for them. Fig. 2 is a 10-ampere double-pole switch with face-plate removed. The mechanism and contact are enclosed in a porcelain base, shown with the front side cut away. The switch plate, one of which is shown in the cut, are of the knife-switch pattern and, owing to the device for driving them into and out of the contact clips, a high velocity and consequently, a short arc is assured. The contact Fig. 3, is of phosphor-bronze, attached to a brass upright, which carries the binding screw. The phosphor-bronze clip is comparatively long and wide, which insures flexibility and firm pressure upon the end of the switch plate. The spring Fig. 4, is a double coiled spring of comparatively large diameter, made of steel music wire, and is intended to engage the moving parts of the switch. It is to be noted that no unnecessary strain is put upon it. The insulation of the current-carrying parts is effected by spools made of sheet mica,

motor, has been designed, and is being built by the B. F. Sturtevant company of Boston, Mass.

As shown in the illustration, the fan itself is of this company's usual steel-plate construction. To its side is attached a cast-iron plate having three projecting lugs. These lugs center and support the field ring, while a light cast-iron support renders the whole arrangement entirely stable.

The motor itself is of the four-pole type, the armature being barrel-wound, and the general construction such as to best suit the conditions specified. Carbon brushes and reaction holders are employed, and the entire design is made such as to insure continuous operation without sparking, even when left unattended for considerable periods of time.

The hemispherical castings, which are bolted to the sides of the field ring, serve to entirely enclose the motor, while the door in the outer casing renders it perfectly accessible. Ring oiler bearings support the shaft, and all trouble from oil is avoided. Fans of this type are primarily constructed for ventilating purposes, and under such conditions create pressures

of about one ounce per square inch. They can, however, be constructed to create higher pressures and to serve as exhaust fans for the handling of refuse material.

Electricity for Private Mansions and Hotels.

The Westinghouse gas engine, under the most severe tests, has proved reliable and efficient. The regulation has been so improved that it is now largely used for electric lighting. This has opened up a new field of usefulness. With gas engines and electric generators, country mansions, country clubs, suburban residences or summer hotels can obtain the best, the most economical, the safest and the most easily manipulated illumination in every room and in every part of the grounds. A gas engine can be started at a moment's notice and stopped with equal promptitude. Gasoline can be used for driving the engine should there be no gas supply in the neighborhood. There is no disagreeable odor and the apparatus is practically noiseless.

Among notable installations of private electric plants driven by Westinghouse gas engines is that at the residence of George Gould at Lakewood, N. J. Fig. 1 illustrates the interior of the power room. Equipments for similar work are now in operation at the following-named summer places: Louis Marx, Alexandria, N. Y.; the Kirkwood Inn, Scarborough Beach, Me.; W. Lutgen, Linden, N. J.; De Le Roy Dresser, Oyster Bay, N. Y.; Miss E. J. Clark, Pomfret, Conn.; A. S. Appar, Ridgfield, Conn.; F. C. Beach, Stratford, Conn.; M. S. Gottfried, Elkhart Lake, Wis.; F. W. Matthiesson, Deer Park, Ill.

One of the most notable instances of the adoption of electricity is that of the Kirkwood Inn, Scarborough Beach, Me., shown in Fig 2. On the coast of Maine, eight miles from Portland, where the summer heat is tempered by the fresh sea breezes, stands the Kirkwood Inn. At an elevation of 75 feet above sea level, the house faces the ocean, looking south. From the veranda a wide sloping lawn, dotted here and there with clumps of evergreens and flowers, reaches to the bluff. At the foot is the ocean, with a two-mile stretch of the finest beach in the world. Behind the house is a thick wood, rivaling the primeval forests in its dense and restful shade. The estate of the Kirkwood Inn includes many acres of woodland, affording a great playground for the visitors to this charming summer resort. Here one may enjoy rambles into the lovely country, cycling, golf and tennis. The more mature can drive through the forest glades, which, at night, are lit electrically. In the midst of the rural surroundings the visitor is astonished to find the comfort and beauty of the electric light.

Standing hidden in the woods, away from the hotel, is the electrical plant. A Westinghouse gas

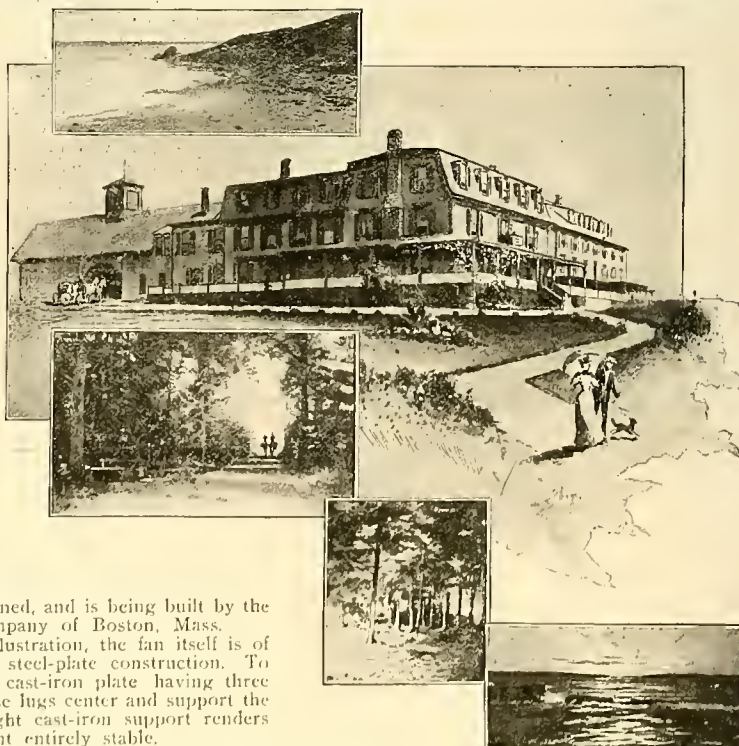


FIG. 2. ELECTRICITY FOR PRIVATE MANSIONS AND HOTELS.

engine of 30 horse power drives a Westinghouse electric generator, and also a triplex pump. Gasoline supplies the motive power to the engine. Wires conduct electricity to light the lawn and grounds. In addition to the interior lighting in every room, the veranda is tastefully festooned with electric lights. The hotel presents a perfect blaze of light that attracts attention from passing mariners many miles out at sea. The pump, operated by the gas engine, supplies thousands of gallons of water each day. A large ice-cream freezer is also driven by the engine. A laundry, which will be electrically op-

erated, is now in course of construction. This plant was installed in the spring of 1898. Its successful and economical operation and its freedom from noise and odor have led to the installation of similar plants in various parts of the country, notably by the Florida East Coast Hotel system, which is installing Westinghouse gas engines at a number of its hotels.

Wherever there is power supplied by a Westinghouse gas or gasoline engine, working in connection with a Westinghouse dynamo, it can be applied to many useful and labor-saving purposes. Not only will it afford a safe, steady and brilliant illumination for the incandescent lamps within the house, but also for arc lamps of greater brilliancy throughout the grounds. It can be applied to the elevator service, sewing machines, ventilating fans, pumps, lathes, sawing, preparing fodder, ice-cream freezers, churns and laundry work. It can be made to supply storage batteries in yachts and automobiles. The heating power may be utilized for cooking and warming the house. All these and many other forms of work are possible with an established gas-engine and electric plant.

Visit to the Schenectady Factories of the General Electric Company.

On Friday, May 26th, the delegates to the convention of the National Electric Light association visited the works at Schenectady as the guests of the General Electric company, which provided a special train comprising seven coaches. The special left New York in the morning, carrying several hundred guests, and arrived in Schenectady about noon. Luncheon was served on the train before Schenectady was reached. On arriving at the works the party was conducted through the buildings, which are located in a tract comprising 130 acres of ground. The first works were started at this place in 1886, having been brought there from New York, and the factories have increased rapidly to their present enormous proportions. The iron foundry, armature-disk department, armature-winding department, power station, assembling, erecting and testing departments, transformer and commutator departments, street-railway shops and complete wire and cable-making plant, general offices and engineering department were visited in turn, and a perfectly bewildering mass of electrical machinery and apparatus, from the smallest parts to the heaviest dynamos, was inspected. Every detail of manufacture has been most carefully worked out, special tools of all kinds being used, with the result of a finished product showing thorough workmanship and the highest engineering design. In the large machine shop one of the most interesting details noticed was the moving by an overhead crane of the machine tools, instead of the casting, on very heavy work, thereby effecting a saving in time, the casting having to be only set once to carry out all the work on it.

During the afternoon the ladies took a drive through the surrounding country. A banquet was afterward served in the gallery of the new machine shop, which is the largest building of its kind in the world. After a most excellent menu speeches were made by C. A. Coffin, president of the General Electric company; S. Dana Greene, general manager, the mayor of Schenectady and others.

Too much praise cannot be given to the officials of the General Electric company and to E. H. Mullin, general advertising agent of the company, in whose hands the details of the trip were left, for the entire success of the entertainment. One and all, they laid themselves out to give the visitors a good time, and they succeeded. After the banquet the special train returned to New York, arriving about midnight.

Automobiles for the Army.

General Greeley, chief of the United States Signal Service, on Monday awarded a contract for three electric automobile telegraph and balloon wagons to be used by the Signal Corps of the army. The successful bidder was the Fischer Equipment company of Chicago. Each automobile will cost about \$1,800, and with about \$1,500 added for extra batteries will make a total of \$8,000. The specifications of the contract provide that two vehicles shall be suitable for heavy work and one for light work. It is proposed to use them in connection with balloon work and experiments to be conducted in the Marconi system of wireless telegraphy. The heavy automobiles are to carry not less than 800 pounds, not including the driver, and to be charged with electricity to run not less than twelve miles without recharging. They are also to be provided with extra wiring to a switchboard inside the wagon, with the terminals, so as to obtain readily, as needed, the entire voltage of a battery of 55 volts or only 10 volts. It is proposed to use the heavy wagons for general delivery or emergency work. They are to be so arranged that at any time they can be converted into a signal corps station, with telegraph lines running to military headquarters, or, when not needed for this work, to carry batteries for general service in the field. The light wagon will be built to carry not less than four persons, and will be fitted with a switchboard the same as the others. Its minimum radius of action without recharging will also be 12 miles. Each vehicle is to be supplied with duplicate batteries and so fitted that it can be drawn by horses. It is proposed to have them fitted with either hard-rubber or pneumatic tires. This, however, will be optional with the inspecting officer.

American and German Iron Workers Compared.

Among the recent work of the Berlin Iron Bridge company of East Berlin, Conn., was a large foundry building for a manufacturing concern of Berlin, Germany. The steel framework was manufactured at East Berlin, in Connecticut, and shipped to Berlin, Germany, and employees of the Berlin Iron Bridge company were sent to Germany to place the steel framework in position.

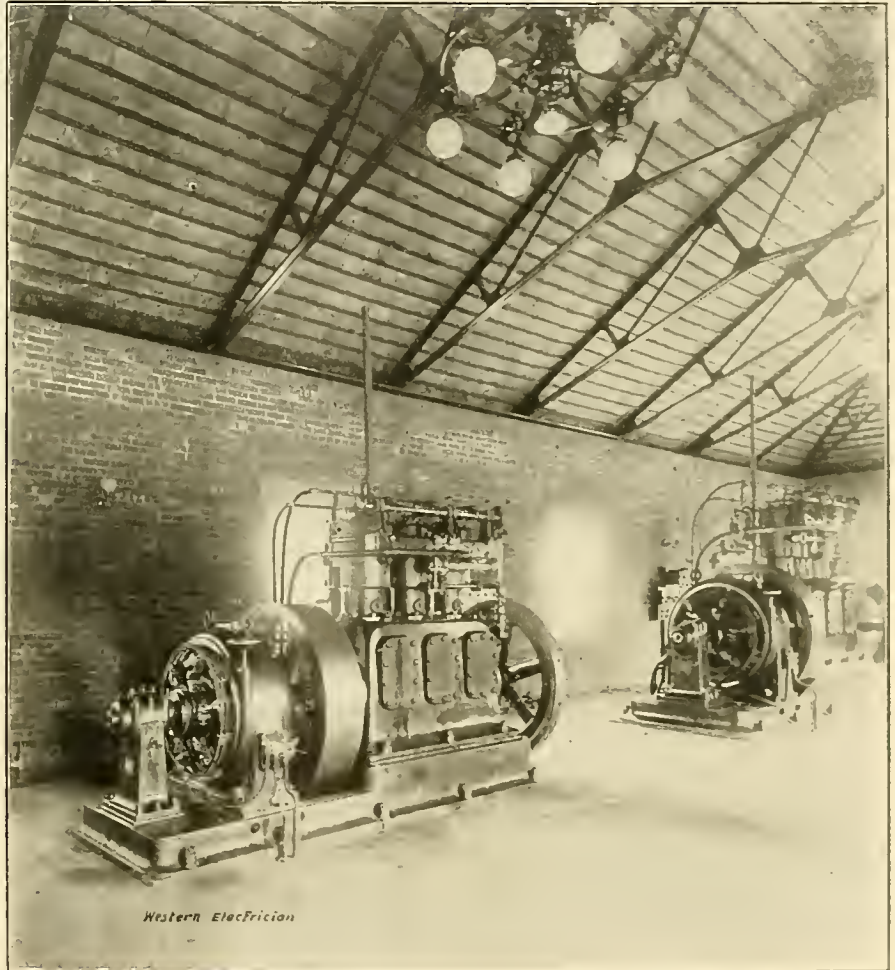
Mr. George Klimm, himself born of German parents, was superintendent in charge of the work, and has but recently returned with his men. As Mr. Klimm and his men were in Germany soon after the breaking out of the Spanish-American war, they naturally excited considerable attention among the German mechanics. Mr. Klimm says, as reported in the Hartford Courant, that as soon as he reached Berlin he found the feeling among all classes of German workmen with whom he came in contact was decidedly against the United States. They had no doubt whatever that Spain would defeat us; and after the destruction of the Spanish fleet and the fall of Santiago, the Germans claimed even then that our victories were due to the fact that our army and navy were full of German officers and gunners. Under no circumstances would they admit any superiority in anything American.

Mr. Klimm, in describing the customs of the German workingman, says: "The ordinary German

many Germans in my gang who were good men; but, after an experience in all parts of the United States, from the negroes of the South to the lumbermen of the North, I have no hesitation in saying that the ordinary Yankee will do as much as any two Germans. At least, that is my experience. They pay their men about the same as we do here. In fact, I found that I had to pay my labor help in Germany as much as I did in almost any part of the United States; but they are not good mechanics and they do not seem to have any idea of taking any advantage of their work. They stand around for the boss to show them how to do anything rather than to go ahead on their own hook. This was especially the case with the men working aloft. In fact, where an ordinary American bridge builder would hang on with his legs and work with his hands, the Germans insisted that they must have a staging built, while in ninety-nine cases out of a hundred the American would have taken less time to do the work than he would to have put in the staging."

"How does the quality of our work compare with that furnished by German bridge builders?"

"I had very little opportunity to observe, but the work which I saw at Berlin, built by German bridge builders, seemed to me much inferior to that furnished by my own company. All our work was carefully punched and fitted before it went from here, so that my work consisted entirely in putting



Western Electrician

FIG. 1. ELECTRICITY FOR PRIVATE MANSIONS AND HOTELS.

mechanic takes a cup of coffee as soon as he gets up and starts in to work at six o'clock in the morning. At 8:30 he knocks off for breakfast, at noon for dinner, and at four in the afternoon he knocks off for lunch, but works until seven in the evening, when he quits for the day and for supper. The food of the ordinary German mechanic is much plainer than we are in the habit of receiving in this country. You must be aware of the fact that bridge builders like myself are in the habit of traveling all over the United States and are familiar with all kinds of fare, but the poorest and plainest I have had in my 20 years' experience was that I received in Germany. We had very little meat and no pastry whatever; but of beer we had any quantity at all times, in all places and under all circumstances. In fact, beer seems to take the place of bread with the German workingman."

"I suppose you employed some German workingmen?" asked the Courant reporter.

"Yes, sir. I took over with me 10 men from here, and employed from 10 to 50 Germans on the work at Berlin, while it was progressing."

"How does the ordinary German workingman compare with the American?"

"The German workingmen are not in it with the American. They don't, as a rule, show any ambition. Of course, there are exceptions, and I had

it in place. The German erectors were very much interested in our method of handling this work, and they were all much astonished to find that I did not have a lot of reamers and hack-saws in my outfit. In America a bridge builder's kit contains a hack-saw or reamer; but in Germany it is the principal tool, as the work is so poorly fitted at the shops that the greatest portion of it must be reamed and fitted in the field.

"I am, of course, employed by the Berlin Iron Bridge company as a foreman, to erect their work, and know nothing about prices, but from what I saw in Germany I am satisfied, from our improved methods of manufacturing, that the American bridge builder can compete successfully with the Germans, and I believe this business will develop rapidly, for certainly they have nothing in Berlin to compare with the building which we lately completed."

The Hackensack (N. J.) Gas and Electric company has absorbed the lighting companies of Englewood, Rutherford and Ridgewood. The consolidated company is to be known as the Gas and Electric company of Bergen County, with \$2,000,000 capital. Frank B. Poor will be president and the controlling interest will remain in his hands.

Taxation of Franchises.

Corporations enjoying franchises in New York are interested in the estimates that are being made of the probable effect of the Ford franchise tax upon their annual incomes. Matthew Marshall of the Sun claims that the estimates hitherto published, both of the value of the franchises and of the amount likely to be derived from the tax upon them, are grossly exaggerated. For example, one newspaper, the day after the original bill was passed, asserted that it would add \$1,000,000,000 to the assessed value of the real estate within the city alone, thus permitting a constitutional addition to the city debt of \$100,000,000, and relieving other property of taxes now paid by it to the amount of \$25,000,000 a year. An expert in the state comptroller's office estimates the yield of the tax in New York at \$10,000,000, and in the entire state at \$15,000,000 to \$17,000,000. That this is also too much only a little investigation is needed to show.

The most numerous franchises in New York reached by the new bill are those of the street-railroad corporations, the largest of which is the Metropolitan Street Railway company. This company owns no lines absolutely, but is the lessee of over 200 miles of the tracks of other companies, and derives from them an annual gross income of over \$11,000,000. The principal tracks it leases are those of the Broadway and Seventh Avenue company, the Second Avenue, the Fourth Avenue, the Sixth Avenue, the Eighth Avenue and the Ninth Avenue, with a number of smaller cross-town lines and extensions. The Metropolitan took these tracks just as they were originally constructed to be operated by horses, and has rebuilt the most important of them, so as to operate them with cables and electricity. Consequently, the rentals it pays are merely rentals of the franchises to build and operate the lines and nothing more, and as these rentals amount to \$2,300,000 a year, that sum, at least, if no more, may be assumed to be the value of franchises. The principal represented by an annual payment of \$2,300,000 is at five per cent. \$46,000,000, and the tax upon it at 2½ per cent. would come to \$1,150,000. Since, however, the custom is to assess real estate at 60 per cent. of its full value, the commissioners would be justified in calling the value of the franchises used by the Metropolitan company \$27,600,000, a tax upon which of 2½ per cent. would amount to but \$690,000, or a little less than 1½ per cent. on the Metropolitan's capital of \$40,000,000.

The street-railroad company in the boroughs of Manhattan and the Bronx next in importance to the Metropolitan is the Third Avenue, which owns 28 miles of cable road, now undergoing a change into an underground electric-trolley road, and nearly 100 miles of road operated by horses and by the overhead electric trolley. The company has a capital of \$12,000,000—shortly to be increased to \$22,000,000—a debt of \$20,000,000 and a gross annual income of \$2,500,000. The chief franchises it has purchased are those of the Dry Dock and East Broadway company and of the Union Railway company. How much it paid for them is not known exactly, but it reported in 1897, among its assets, stocks and bonds and other permanent investments to the amount of over \$6,000,000, and the premium on its present capital is \$12,000,000, making a total of \$18,000,000, of which 60 per cent. is \$10,800,000, yielding, at 2½ per cent., \$270,000.

In the borough of Brooklyn the Brooklyn Rapid Transit company, with a capital of \$40,000,000 and a debt of \$12,000,000, now owns or leases, altogether, 164 miles of horse and electric-trolley road, for a part of which it pays in rentals \$1,560,000 annually, besides having issued stock to the amount of \$9,500,000 to purchase the rest. Capitalizing \$1,560,000 at five per cent. gives \$31,200,000, and adding to it \$9,500,000, gives a total of \$40,700,000. The expenditures on the property for construction and equipment have probably been met by its bond issues, so that \$40,700,000 may be assumed to represent the value of the company's franchises. Of this 60 per cent. would be \$24,420,000, and a tax of 2½ per cent. on it would be \$610,500, or about 1½ per cent. on the company's \$40,000,000 capital.

No data are accessible for the computation of the value of the Manhattan elevated-railway franchises. Of the \$48,000,000 present capital of the company only about one-half, or \$24,000,000, represents cash paid, the other \$24,000,000 having been given away to purchasers of the bonds with which its structures were built and equipped. Since the stock is selling at 10 per cent. premium, its franchises are therefore certainly to be reckoned as worth \$24,000,000, and adding \$4,800,000 for the premium on the stock, they may be said to be worth \$28,800,000, of which 60 per cent. is \$17,280,000. A tax on this amount of 2½ per cent. would yield \$432,000, or less than one per cent. on \$48,000,000. The two elevated railroads in the borough of Brooklyn have both recently been sold for a price which makes the value of the franchises for them very doubtful, and it may be estimated at nothing.

The only steam surface railroad companies enjoying franchises in New York are the New York Central in the borough and the Long Island in the borough of Brooklyn. The principal franchise belonging to the Central it holds through its lease of the Harlem line, only a short stretch of which lies within the city limits. For the entire Harlem line

the Central pays a rental of \$840,000 yearly, and it has expended, besides, more than \$8,000,000 in adapting to the city's requirements the section between Forty-second street and the Harlem River. How much it would have to pay for an entrance into the city over a roadbed owned in fee it is hard to estimate, and in any case it would have to cross a number of streets either above or below grade. A strip 100 feet wide from Forty-second to One-hundred-and-forty-second street would embrace 800 lots in the blocks, and the equivalent of 300 lots for the street crossings, making 1,100 lots in all, which, at \$25,000 a lot, comes nearly to \$28,000,000, and at a 60 per cent. valuation, to \$16,800,000, on which a 2½ per cent. tax would yield \$420,000. The right-of-way into Brooklyn enjoyed by the Long Island Railroad company is, of course, far less valuable, and may be roughly estimated at \$10,000,000, or, for taxing purposes, at \$6,000,000, on which the tax of 2½ per cent. would amount to \$150,000.

The appraisalment of gas-company, subway-company and telegraph-company franchises is a difficult matter. If the commissioners should adopt the Massachusetts rule, and arrive at the value of the franchises by taking the market value of the stocks of the companies enjoying them, deducting from it the assessed value of all other property, and calling 60 per cent. of the remainder the value of the franchises, the amount would be startlingly large. Approximately, the Consolidated Gas company's franchises are worth, on this method of estimate, \$30,000,000, those of the Brooklyn Union company \$20,000,000, those of the New Amsterdam \$10,000,000, those of the Standard \$10,000,000, and those of the Mutual \$5,000,000. The subway privileges of the New York Gas and Electric Light, Heat and Power company may be put down at not less than \$10,000,000, and those of the Kings County Electric Light and Power company at \$5,000,000. The Western Union Telegraph company uses the subways of the New York Gas and Electric company and pays rental for them, and the American Telephone company strings its wires from housetop to housetop, so that none of them will have to pay the new tax.

Summing up the foregoing estimates, none of which can be said by anyone to be too low, and most of which will by the companies affected probably be scouted as far too high, the amounts added to the taxable real estate of the city by the new law are:

Metropolitan Street Railway	\$ 27,600,000
Third Avenue	10,800,000
Brooklyn Rapid Transit	24,420,000
Manhattan Elevated	17,280,000
New York Central Railroad	16,800,000
Long Island Railroad	6,000,000
Gas and electric companies	90,000,000
Add for small companies omitted	1,100,000
Total	\$184,000,000

This gives \$184,000,000, at the utmost, for the value of franchises in this city, and it is not probable that it will be raised by the commissioners to more than \$200,000,000. Assuming the franchises of other parts of the state to be, like their other assessed property, worth two-thirds as much as those of New York city, their value on this basis will be \$133,000,000, making \$333,000,000 for the entire state. A tax of 2½ per cent., therefore, would give \$5,000,000 only for the city, and \$8,333,333 for the entire state, or about one-half the estimate of the comptroller's expert, and a much smaller fraction than those of the newspapers.

Telegraph Line to Dawson.

H. A. Munn of the Victoria Yukon Trading company, who has just returned to Victoria, B. C., from Lake Bennett, tells the local newspaper writers of great progress being made by the telegraph builders. He says: "The telegraph construction party sent out by the Dominion government under Mr. J. B. Charleson has lost no time in getting to work on the line to Dawson. The poles are already cut down as far as White Horse, and the wire will very soon be strung to Cariboo Crossing. Two camps are operating now, one from Bennett and one from Cariboo Crossing, but so soon as the lake and rivers open the construction corps will be divided into three parts, the men living on camp scows, which will drop down the river, keeping abreast of the work. The materials and supplies will be delivered on scows. Mr. Charleson is determined to have a message from Dawson before the close of the season of 1899."

The Gorge Railroad Sold.

The Niagara Falls and Lewiston electric railroad, better known as the "Gorge road," has been sold at sheriff's sale and was purchased by Herbert P. Bissell of Buffalo for \$6,184, which was the amount he had advanced to the receiver, on behalf of the creditors, to put the line in repair. The sale was subject to a mortgage of \$1,000,000. Mr. Bissell has reorganized the company, and in the future it will be known as the Niagara Gorge Railroad company. The capital of the new company will be \$1,000,000, whereas the old company was capitalized at \$1,400,000. New York and Buffalo capital will be interested in the new company. All winter the line has been idle, but during the month of May Mr. Bissell had about 200 men at work putting the roadbed and overhead construction in good repair in order that the road might renew operations in June.

Capt. George H. Tilly Reported Dead.

General Greeley, chief signal officer of the army, received a cablegram on May 28th from Major Thompson at Manila, reporting that a party landing for the repair of the cable at Escalante, Island of Negros, had been treacherously attacked by natives, that Captain George H. Tilly, Signal Corps, was missing, and that the worst was feared. Tilly's services in the Philippines, says a Washington correspondent, have been marked by such ability, courage and zeal that his superiors placed him in the foremost rank of subordinate officers. The cable operations referred to are not those of the Signal Corps, but of the Eastern Extension Cable company, which has been permitted to repair and replace certain cables in the Visayan Islands. Tilly doubtless accompanied the expedition as the representative of the United States, the supervision of all telegraph lines and cables being a part of his duties. No other casualties in the Signal Corps have been as yet reported in this expedition.

Captain Tilly was a well-known resident of Helena, Mont. He was the son of George E. Tilly of Jamaica, L. I., and at the outbreak of hostilities was night manager of the Western Union Telegraph company in Helena. Captain Tilly was well known in New York and Chicago, where he was formerly employed. He was under orders to return home soon, and was on detached orders with a few of his men, awaiting relief.

Electrical Development of Las Vegas.

The city of Las Vegas, in New Mexico, which has a population of less than 10,000, is an enterprising, up-to-date community. It has a street-car line, established in 1881, of which E. Rosenwald is the president, and two telephone exchanges. The Colorado company, of which Mrs. A. M. Shout has been manager since 1884, has in use 143 city instruments, with stations at the Hot Springs, the Agua Pura reservoir, Rociada, Mora, Sapicilo, La Cueva, San Ignacio, Watrous, Los Alamos and El Porvenir. The Las Vegas company, organized in 1894, with V. H. Jameson as manager, has 126 city telephones. Under competition rates have been reduced to \$36 per year for business houses and \$15 per year for residences. The Western Union Telegraph company has two offices, George M. Birdsall, manager, while the Postal company has one, with Mrs. Gray in charge. There is also a flourishing electric-light company.

Stole 700 Feet of Live Wire.

[From the New Haven Evening Register.]

The Fair Haven and Westville Railroad company reported to the New Haven police that thieves had stolen several hundred feet of feed wire belonging to the railroad and in use on the Whitney avenue line. It was an extraordinary piece of thievery and unique in this locality. It was a case of stealing "live" and "hot" wire.

The feed wire runs along on the poles and is used to reinforce the power of the trolley wire. The feed wire is a heavy wire, weighing about one pound to the foot, and is heavily insulated. It costs the railroad company about 20 cents a pound.

About 700 feet of the wire was stolen by the thieves. The wire is alive all night. The cutting of it must have been attended with considerable danger, unless the ordinary protected plyers used by railroad men were employed to cut it.

It is not known exactly at what hour the wire was cut and stolen, but it probably was near midnight, when all cars had ceased to run. The crew on the first car out yesterday morning discovered the theft. The wire taken by the thieves weighed about 700 pounds, and can be sold for junk at about 15 cents a pound.

COMMUNICATIONS.

Electric Lighter for Fire-engine Boiler Wanted.

To the Editor of the Western Electrician:

I am looking for an automatic lighter to attach to a quick-steaming boiler belonging to our fire department, so that the pulling of any street box will light the fire in addition to ringing the alarm. Not having gas, I am rather puzzled how to accomplish this result. If any of your advertisers deal in anything that would meet my ideas, kindly place me in communication with them.

A. L. BOWES,
Assistant Chief of Fire Department.
Millville, Mass., May 28, 1899.

New Rheostats for Old.

To the Editor of the Western Electrician:

This company is making a collection of rheostats and already has a number of curious specimens. To make this collection more complete we will replace to starting rheostats over five years old and under 10 horse power with our latest type of apparatus. If you will kindly insert this notice in your reading columns we shall be greatly obliged.

J. GILBERT HICKCOX,
Secretary Cutler-Hammer Manufacturing company.
Chicago, May 29, 1899.

CORRESPONDENCE.

New York Notes.

New York, May 29.—Bids for public lighting of the city by gas and electricity were opened last week by Henry S. Kearney, commissioner of public buildings, lighting and supplies. For years the city has been divided for street lighting among the various gas and electric-light companies, and there has been no competition. The same conditions, practically, prevail this year. The electric arc-light bids for Manhattan were: Harlem Lighting company, 40 and 50 cents a lamp a night; Brush Electric Light company, 40, 45 and 50 cents; Union Electric Light and Power company, 10 and 15 cents an hour; Manhattan Electric Light company, 40 and 50 cents a night; Edison Electric Illuminating company, 40 cents a night; Mount Morris Electric Light company, 40 and 45 cents a night. For electric lights in the Bronx the North River Electric Light and Power company bid 45 cents a lamp a night; the Pelham Electric Light and Power company, 30 cents, and the Bronx Gas and Electric Light company, 35 cents. There was but one bid for electric lights in Brooklyn, that of the Edison Electric Illuminating company, which was the same as last year—34 cents a night for each 1,200 candle-power lamp and 17 cents for each 600 candle-power lamp. The Jamaica Electric Light company's bid was 27.4 cents a night for each arc lamp. For Richmond, the Staten Island Electric company bid 27.4 cents a night for each arc lamp.

In Hoboken the new North River Light, Heat and Power company, which is building a large plant to compete with the North Hudson Light, Heat and Power company, has hit upon a novel plan to get a foothold. It seems that the contract of the city of Hoboken with the old company for electric street lighting contains a clause terminating the agreement at any time when the tax commission's shall fail to make the necessary appropriation. Accordingly, the new company addressed itself to the tax commissioners and showed them that they need make no appropriation, because they might have the lights free for the remainder of the present fiscal year from the new company. The contract would thus be abrogated, it was argued, and after the free term the new company would bind itself to furnish public lighting for from two to 10 years at a rate not exceeding \$80 a year a light, the present rate being \$138.70 a year. Thus, says the new company, the city may save over \$50,000 by terminating the existing contract, which was made in September, 1892, for a term of 10 years. For doing this the new company asks the right to use the streets on the same terms as the company now doing business. Mr. Bonta, the president of the North River company, explained to the tax commissioners that it was only necessary for them to fail to make an appropriation of \$28,000 asked for electric street-lighting purposes, and the contract with the old company would terminate. "We will then furnish electric light free to the city for the rest of the fiscal year, ending April 30, 1900," he said. "If the council gives us a franchise we will be ready to have all the poles and wires up in 10 days." Mr. Bonta presented a bond for \$25,000, issued by the American Surety company, to show that the company meant what it said. The tax commissioners all said that the scheme proposed by the new company was a good one, and a report of a committee explicitly stating that no appropriation was to be made for street electric lighting was unanimously adopted. Another resolution was adopted, asking the council to accept the new company's proposition. Mayor Fagan, who is said to favor the old company, entered the room before the final action was taken by the board. He made no remarks other than to say to a reporter that the council has the power to amend the tax ordinance making appropriations before confirming the budget.

Alexander E. Orr, formerly president of the Rapid Transit Commission, was re-elected to that office at a special meeting of the commission held last week. Mr. Orr's term of office as commissioner expired upon his resignation of the office of president of the Chamber of Commerce, but he was re-elected a member of the commission to succeed John Claffin, who resigned. The resignation of Lewis L. Delafield, the secretary, was not acted upon. It will be, however, at a meeting called for June 1st, and his successor will then be chosen from the large number of applicants who are seeking the place.

The New York Municipal Street Railway company, which was recently incorporated to build an electric railroad in the northwestern part of the borough of Manhattan, will be given a hearing June 5th on a bill granting it a franchise.

An official of the Manhattan company is reported as stating that plans for the electrical equipment have been made and that specifications will probably be ready in a few days.

A fine "practical joke," by which it is possible that an employe of the Paterson Railway company was killed, is reported in the papers. It is the practice at the street-railway shops in Paterson for the employes, in washing after their day's labor, to use soft soap, which they take from a barrel. About 6 o'clock Magill, the victim, went to "wash up." When he dipped his hands in the barrel he gave a loud scream and dropped to the pavement, which was wet. Andrew Lasky, who was close be-

side Magill, leaned down to pick him up, but found that Magill was dead. Subsequent examination led to the discovery that a wire had been run through the barrel of soft soap and connected with a trolley wire. The wet pavement completed the circuit. Joseph Grant and Christopher Ashfield, fellow employes of Magill, the perpetrators of the "joke," were taken to jail on a charge of manslaughter. They admitted that they ran the wire through the barrel with the intention of shocking those who should use the soap, and meant it merely as a practical joke. The railway potential of 500 volts is not considered sufficient to kill a man in ordinary health, but the dead man may have had a weak heart. At any rate, the joke was a cruel and dangerous one, and doubtless its authors will be severely punished.

M. S.

PERSONAL.

Arthur S. Ives, electrical engineer of the Prindle Pump company of New York, is spending a few days in Chicago.

Clinton L. Rossiter, president of the Brooklyn Rapid Transit company, returned from Europe on Memorial Day. His trip abroad was undertaken entirely for recreation, he said.

General William A. Bancroft, general manager of the Boston Elevated Railway company, received an offer from the Chicago West and North Side surface lines to become the general manager of that system. He announced his decision, however, to remain in Boston. He is brigadier-general of the Massachusetts militia and went to camp as a volunteer in the late war, although not called upon to perform active service at the front. His salary in the position he now holds is said to be \$25,000 a year. He has been mayor of Cambridge, Mass., three terms and holds a prominent place in the affections of the people of the state, many of his friends asserting that he can be elected as governor whenever he says the word. In his college days at Harvard he was famous as an athlete and was captain of the university crew that defeated Yale.

Prof. Thomas R. Mercein of Milwaukee, the secretary of the Northwestern Electrical association, was one of those who did not escape the vigilance of the interviewer of the New York Tribune during the recent convention in that city. Wireless telegraphy was the subject of the conversation, and Prof. Mercein is thus reported: "The scope of wireless telegraphy depends entirely upon the degree of perfection which can be attained in the instruments. It has been used across the English Channel, a distance of 30 miles. Interpassing ships and other obstacles did not interfere with it in the least. Theoretically, there is no reason why messages should not be flashed over the ocean in the same way, but the instruments used at present are not sufficiently perfected to permit this. Some of the best talent in the world is at work on the subject, and I believe that it will be a matter of only a few years at most until Marconi's system is conceded to be as practical as the telephone."

PUBLICATIONS.

Kendrick & Davis, successors to the Porter Standard Motor company, Lebanon, N. H., have issued a neat little catalogue, describing their various products. The Porter Standard motors, now manufactured by Kendrick & Davis, are well known.

The Western Electric company has mailed to the trade bulletins on the S. K. C. single-phase motors and Type G transformers. They are Nos. 101, 102 and 103. The S. K. C. lightning arrester for alternating-current apparatus is fully illustrated and described in Bulletin No. 104.

Five catalogue bulletins recently issued by the Westinghouse Electric and Manufacturing company give, by a mere enumeration of titles, some idea of the varied activities of this important company: No. 222, "Direct-connected Railway Generators;" No. 223, "Lightning Arresters for Alternating-current and Direct-current Circuits;" No. 225, "Alternating-current Fan Motors for 50 and 100-volt Circuits;" No. 226, "Direct-current Fan Motors for 100-125-volt Circuits;" No. 228, "Polyphase Motors." These publications are attractively illustrated and are at once valuable to the consumer and creditable to their authors and designers.

The elaborate treatise on "Mechanical Draft" recently issued by the B. F. Sturtevant company of Boston, Mass., is unique as a trade publication in that it presents no personal claims for the merit of the system or the apparatus necessary for its operation, but relies solely on the statements of unbiased witnesses to emphasize its features. For this reason the following quotation from this important work is of especial interest and value. It consists of a summary of the especial advantages of mechanical draft, as presented by the well-known engineer, Mr. Alfred Blechyden, in a paper before the British Institution of Mechanical Engineers. Mr. Blechyden says: "First, it seems fairly well established that, if the boilers are well constructed and are provided with ample room to insure circulation, their steaming power may, without injury, be increased to about 30 to 40 per cent. over that obtained on natural draft for continuous working, and may be about doubled for short runs. Secondly, such augmentation is accompanied, in normal cases, by an increased consumption per indicated horse

power. But, thirdly, the amount of greater power being indicated, it may, with moderate assistance of forced draft, be developed with a smaller expenditure of fuel, the grates, etc., being properly proportioned. Fourthly, forced draft enables an inferior fuel to be used; and, fifthly, under certain conditions of weather, when, with normal proportions of boiler it would be impossible to maintain steam with natural draft, the normal power may, with forced draft, be insured. In particular cases any or all these advantages may be a source of economy; and the first of them may render possible that which would otherwise be impracticable."

TRADE NEWS.

The Krotz-Kelly company, formerly Krotz, Allen & Kelly, exploiters of the K. A. K. conduit electric-railway system, is now actively pushing its system. The K. A. K. electric-railway system has been in practical operation in Springfield, O., for some time, and good results are claimed.

Bids for furnishing and installing a complete police-patrol system throughout the city of St. Paul, Minn., will be received by Matt. Jensen, the city clerk, until June 15th. The proposals must include the removal of the present system and the installation of a new system on plans laid down by the bidder himself.

The Bureau of Supplies and Accounts of the Navy Department is inviting sealed proposals, until June 6th, for furnishing the naval home at Philadelphia, Pa., with a quantity of electrical supplies required during the next fiscal year. Blank proposals will be furnished upon application to the governor of the naval home.

The Navy Department, through the Bureau of Supplies and Accounts, is inviting sealed proposals, until June 6th, for furnishing the Norfolk, Va., navy yard with four generating sets and spare parts. Blank proposals will be furnished upon application to the Navy Pay Office at Norfolk. Bids will also be received at the same time and place for furnishing the New York navy yard with two generating sets and spare parts for one set. The Navy Pay Office at New York will furnish any information desired by intending bidders.

BUSINESS.

The Hemingray Glass company of Covington, Ky., is busy with orders and takes an optimistic view of the business situation.

The advantages claimed for the Moloney transformer, manufactured by the Moloney Electric company of St. Louis, have now become so well known that the company is kept busy filling its orders.

The Nowotny Electric company of Cincinnati is securing its share of the arc-lamp trade. The company has placed on the market the Nowotny long-burning enclosed arc lamp for inside and outdoor service.

The Electric Appliance company calls especial attention to a clever torch known as the Willson combination alcohol torch. This torch seems to be a useful tool for all electrical workers and should find a large market.

James Leffel & Co. of Springfield, O., the well-known water-wheel manufacturers, find it a difficult matter to keep up with their orders. The company has been obliged to work its force overtime, and reports that the demand for its products is greater than ever.

John S. Nowotny, 373 East Second street, Cincinnati, manufacturer of arc lamps and dealer in electrical specialties, states that he is meeting with success in his new venture. Mr. Nowotny is well known to the electrical trade and is the inventor of the Nowotny arc lamp.

The Robbins & Meyers company of Springfield, O., states that the sales of its standard fans have been so large that it has been obliged to put on a night force. The Robbins & Meyers company has just purchased a large factory adjoining its present shops, and it is stated that it will shortly go into the manufacture of dynamos and motors.

A. C. Becken, 103 State street, Chicago, who handles the Paillard non-magnetic watch, says that he has met with success in placing this watch among the electrical fraternity. The Paillard watches are said to be good timekeepers, and have been welcomed by those who come in proximity to electrical machinery, as they are guaranteed to be absolutely non-magnetic.

Martin De Tamble has placed a contract with the Western Electric company for one 40-kilowatt Western Electric direct-current generator and a switchboard. The construction department of the Western Electric company will install the apparatus and do the wiring for 500 to candle power lamps. The installation is for the building at 153 West Jackson boulevard, Chicago.

The Vesta electric bicycle lamp, manufactured and placed on the market by the Vesta Accumulator company, of which D. P. Perry is president, is said to be meeting with great success. It seems to be giving the best of satisfaction, and many points of superiority over other bicycle lamps are claimed. The demand for the Vesta lamp is increasing daily.

and Mr. Perry is well pleased with his sales and the prospects for future business.

The Lynn Incandescent Lamp company of 681 Washington street, Lynn, Mass., calls particular attention to the advantages of its "renewed" lamps. It publishes testimonials to the efficiency of these lamps from the Jellico (Tenn.) Electric Light, Heat and Power company; Southern Electrical Works, Atlanta, Ga.; Abner Driver, Osceola, Ark., and C. F. Kissel, Indianapolis, Ind.

The single-pole carbon lightning arrester, for telephone and telegraph use, which has recently been placed on the market by the American Electric Fuse company, 345 South Canal street, Chicago, is claimed to be selling well. The manufacturer states that this is the only single-pole carbon lightning arrester made and that it embodies features which will interest all telephone and telegraph men.

The American Reflector and Lighting company of Chicago reports a steadily increasing business in reflectors, etc. The American company is one of the best known in this line of business, and under the careful supervision of Manager Charles Landis it is meeting with success. It has made some of the largest reflector installations in the United States, and is always on the alert for improvements in this particular line.

The Hobart Electric Manufacturing company of Troy, O., under the careful management of G. C. Hobart, has worked up an excellent trade in dyna-

mos and motors. The company claims many points of superiority for its machines. The Hobart company is prepared to rent dynamos and motors, giving the lessee the privilege of buying the machine at any time, and is meeting with success in this particular branch of its business.

M. J. Isaacs, general manager of the K. McLennan company of Chicago, the well-known manufacturer of Gale's commutator compound, reports that the sales of this widely known compound are constantly on the increase. At the present time it is used not only in every state in the Union, but in many foreign countries as well. Gale's compound must be giving entire satisfaction to all those who have used it, judging from its popularity.

In every electric-light station in the country there are old lamp bases, many of which, doubtless, are thrown aside, and in that way wasted. Goldsmith Brothers, 63 and 65 Washington street, Chicago, make a specialty of buying up old lamp bases, for which they pay a cash price, besides paying the freight. They have been long established, do more in this line of business, it is said, than any other house in the country, and through their wide trade have gained an excellent reputation for fair dealing.

The Central Electric company, Chicago, is pleased with the rapidly increasing orders for the ventilating outfits built by the Fuller company. This type of apparatus is built direct-connected for operation on

direct-current circuits of from 110 to 500 volts. The blades of the fans are scientifically calculated as to their helical pitch for angle of contact with the air, and this fact, in connection with a proper proportion of fan diameter with the actual horse power of motor, produces a highly efficient product. The Fuller "air propellers" can be used for exhaust or forced-draft purposes. Should it be desired to change the direction of the air current after the motor is installed, the desired result can be effected readily by a reversal of terminals.

The Bullock Electric Manufacturing company of Cincinnati, Ohio, is experiencing the practical results of prosperous times, coupled with a record for high-grade electrical machinery. With the new factory, with treble the capacity of the former works, and with new tools being added almost daily, the company still finds it very difficult to supply promptly the machines called for by its sales department. But this difficulty will soon be obviated by increased facilities. Numerous special machine tools, which have been delayed by the crowded condition of the makers' factories, are soon to arrive, and with these in operation it will be possible to deliver more promptly. The Type "N" Bullock slow-speed motor, so admirably adapted to the driving of machine tools and other machinery by direct connection, is receiving much deserved attention from consulting and contracting engineers both at home and abroad.

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued May 23, 1899.

- 625,321. Socket for Incandescent Lamps. Adolphe A. Chaillet, Shelby, O. Application filed February 28, 1898.

A cam member for an incandescent-lamp socket consisting of the annular insulated block flat on its base but having on its top surface ratchet-cam faces, there being depressions of varying degrees between the faces, deeper depressions being adapted to receive metallic plates which form electric terminals.

- 625,364. Electric Signal. Julian M. Smith, New Orleans, La. Application filed April 30, 1898.

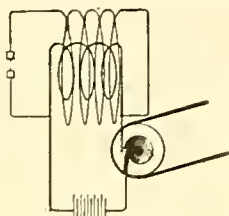
A lever is arranged to move the circuit-closer; a latch on the lever is arranged to engage the circuit-closer, and a movable device on the lever is connected with the latch.

- 625,408. Electro-mechanical Apparatus. Albert D. Neal, Boston, and Howard F. Eaton, Quincy, Mass. Application filed November 19, 1892. Renewed October 27, 1898.

The movable arm has an electromagnet to move it in one direction, a second electromagnet to move it in an opposite direction, means operated by the electromagnets to produce a multiplied or extended movement of the arm, movable stops or pins operatively connected together to be simultaneously moved, to limit the movement of the arm or device at different points or stations in the range of its movement, and electromagnets to operate the pins or stops.

- 625,410. Apparatus for Producing Igniting Sparks. Max Osterberg and Alexander Fischer, New York, N. Y. Application filed April 21, 1898.

In an electric spark-producing apparatus the combination of a primary coil, a circuit-breaker in circuit therewith, means for mechanically operating the circuit-breaker to produce a single rapid break after a relatively long period of closure of the circuit, and in shunt with the primary coil and in inductive relation thereto a secondary coil and spark terminals in the circuit thereof.



NO. 625,410.

- 625,431. Electric Arc Lamp. Sigmund Bergmann, New York, N. Y. Application filed May 7, 1897.

An arc-including chamber is adjustable relatively to the carbon feeding and regulating mechanism, and an outer including chamber is adjustable relatively to the arc-including chamber.

- 625,432. Electric Arc Lamp. Sigmund Bergmann, New York, N. Y. Application filed April 17, 1898.

Combined with the actuating magnets of an armature are a guide, a yoke mounted on the guide, a clutch and dashpot carried by the yoke, and a spring surrounding the guide and interposed between the yoke and the armature.

- 625,454. Regulator for Electric-car Motors. Hiram S. Maxam, London, England. Application filed November 5, 1898.

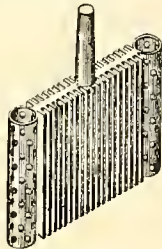
Each car of a train of electrically propelled cars has a rod or bar movable longitudinally with respect to the car, means for maintaining the bars in a given normal position with respect to their respective cars, connections between the bars and the circuit controllers on the cars whereby the current applied to each car motor will be varied in accordance with the changes of relative position of the rod and the car, the rods or bars being coupled together in an inextensible series throughout the train.

- 625,462. Electrode for Dry Storage Batteries. Leonard Pavet New York, N. Y. Application filed December 30, 1898.

An electrode for dry storage batteries is provided with exterior vertical electrically conducting tube of tubes, and the tube or tubes are in electrically conductive connection with the electrode.

- 625,473. Electrical Attachment Plug. Albert P. Seymour, Syracuse, N. Y. Application filed February 9, 1899.

An unglazed porcelain plug member is formed with a shank and a disk-shaped upper portion of only slightly greater diameter than the shank, having a flat upper surface, terminals secured to the shank and terminals arranged and secured on the flat upper surface, and an externally glazed cap having a depending marginal wall forming within an opening fitted to receive the top of the plug, and integral reinforcing projections within the opening extending downwardly and inwardly to engage with the upper surface between the terminal plates and sustain the cover a short distance above the flat surface, but permitting it to drop sufficiently to surround the plug top.



NO. 625,462.

- 625,489. Holder for Electroplating. William Y. Buck, Bristol, Conn. Application filed November 4, 1898.

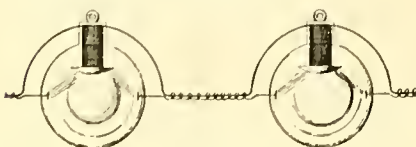
In a holder for electroplating a bar of conductive material, perforated from top to bottom, at right angles with its longitudinal axis, by a number of holes, which are arranged from end to end of the bar at a convenient distance apart, and are alternately inclined in opposite directions from the vertical and from each other, in combination with a conductive handle, which is rigidly united with the bar, and is adapted to hold the same suspended in a bath in a horizontal position.

- 625,512. Electric Railway. Robert Lundell, New York, N. Y. Application filed April 5, 1898.

In an electric railway a current feeder or main including a source of electrical energy, together with sectional service conductors and electromagnetic switching devices for operatively connecting the sectional service conductors in sequence to the current feeder or main; in combination with stationary relays for operating the electromagnetic switching devices, the relays being included in a circuit with a separate or independent source of electrical energy.

- 625,554. Trolley Controller. Louis M. Halsey, New York, N. Y. Application filed November 24, 1897. Renewed November 1, 1898.

The trolley pole, the slotted harp thereon, a spring-actuated reel carried by the pole, and a rope guide on the harp, in combination with a U-shaped lever mounted in the harp, a trolley wheel and its shaft carried in one end of the lever, the overhung ends of the shaft being received and guided in the slots in the harp, a dog at the opposite end of the lever adapted to engage a trolley rope passing through the guide, and a spring tending to tilt the lever and force the dog into engagement.



NO. 625,509.

- 625,566. Manufacture of Elements for Secondary Batteries. Frank King, London, England. Application filed November 25, 1898.

An element for secondary batteries consisting of a grid having active material applied thereto, the outer or exposed surface of the active material being formed with pyramidal projections.

- 625,597. Means for Ascertaining the Potential at Any Point Upon Systems of Distribution. Samuel L. Phillips and George G. Tilden,

- Washington, D. C. Application filed March 6, 1899.

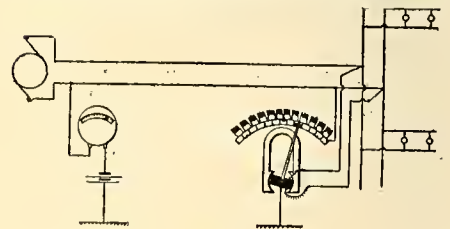
Claim is made for the combination with a system of electrical distribution of a measuring instrument at any point of distribution connected to the mains at that point to indicate variations in potential, a responding instrument at the generating station connected to one of the mains and to earth through a battery, and one or more resistances in the battery circuit, cut in or out by the vibration in opposite directions of the index of the measuring instrument.

- 625,599. Electric-lighting Apparatus. Andrew Plecher, Savannah, Ga. Application filed October 4, 1898.

An electric X-ray lamp comprising a vacuum bulb with two cathode terminals, and one or more electromagnets wrapped to form induction coils having each one pole within the bulb and provided with a light-emitting surface, the induction coil having a central core, a helix connecting with a primary wire, another helix connecting with the secondary wire, the end of the secondary helix being connected to the core of the induction coil and forming the cathode terminal.

- 625,609. Incandescent Electric-lamp Fixture. Benjamin F. Rout, Stanford, Ky. Application filed August 2, 1898.

A lamp fixture comprising a support, a casing section rigidly mounted on the support, a casing section mounted to rotate relatively to the fixed section, a drum secured to the rotatable section and designed to receive and wind the electric conductors, a spring for moving the drum and rotatable section in one direction, and a socket on the rotatable section for receiving the base of an electric lamp.



NO. 625,597.

- 625,632. Electric Controller. William W. Adams and Harold McGeorge, Cleveland, O. Application filed October 17, 1898.

The combination in a controller of the casing having a hub, a series of concentric spools, a segmental bridge mounted on the casing and carrying contact plates, and a brushholder having brushes adapted to move over the surface of the plates.

- 625,639. Electrical Switch. Norval L. Burchell, Washington, D. C. Application filed December 14, 1898.

In an electric switch there is the combination of a pole-piece, a switch blade and operating means therefor, the parts being so arranged that the switch may be opened and locked by a straight pull or push and then closed by a continuation of the motion in the same direction.

- 625,647. Alternating-current Range and Position Finder. Albert C. Crehore, Hanover, N. H., and George O. Squier, Fortress Monroe, Va. Application filed January 29, 1898.

The method of obtaining parallelism between two instruments at a distance from one another consists in varying the reactance of an alternating-current circuit at one point in correspondence with the position of the instrument at such point and correspondingly varying the reactance in the circuit at the other instrument to restore the balance or normal condition of the circuit.

- 625,683. Electrode for Secondary Batteries. Jules Julien, Brussels, Belgium. Application filed October 24, 1896.

In a Plante accumulator a negative electrode is formed of a series of superposed corrugated sheets of suitable metal, having the corrugations running diagonally to the sides thereof, and having active material applied on both sides thereof, while leaving narrow diagonal interstices for the access of the electrolyte and bands for connecting the sheets together.

Western Electrician

EVERY SATURDAY.

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CHICAGO, JUNE 10, 1899.

No. 23

Suspension Bridge for Trolley Lines at Niagara.

The new suspension bridge being built by the International Traction company across the lower Niagara River, near Lewiston, is nearing completion, and it will not be many weeks before it is brought into service for the crossing of electric cars, thus making the second international crossing-place between New York state and the Dominion of Canada for trolley cars, the first being over the upper steel arch bridge, seven miles up the river.

In the construction of this new bridge there has been ample opportunity for comparison afforded between the past and the present-day methods in bridge construction across great rivers, for on this iden-

double-tracked, in order to afford every facility for cars passing on and off the bridge.

The view presented in the illustration is looking from New York toward the Canadian side. The erection of steel commenced on the New York side and proceeded out over the river to Canada, extremely rapid progress being made. It is expected that the bridge will be opened to public crossing this month.

Chicago North and West Side Surface Roads Leased to Chicago Union Traction Company

By vote of the stockholders of the North Chicago Street Railroad company and the West Chicago Street Railroad company, on June 2d, the street-car

It has always been my idea that all the street-railway companies in Chicago would have to be consolidated. The intramural system of this city has always tended toward that end. In laying out the North and West Side lines and the suburban lines it has always been my idea that some time they would come under one head. When we are a great metropolitan city, instead of a scattered community, it will be necessary for the street railways to be combined—not only the surface roads, but the elevated roads as well. It is not for me to do that work, but it is one of the inevitable things of the future. I regard it as absolutely sure that some day all the intramural lines will be consolidated under one management.

The management of the North and West Side companies has spared no effort, no labor, no thought, to make the companies the best to be found anywhere. If we had had a little better feeling between the municipality and ourselves we could have accomplished more. The municipality has seemed to think that the companies alone had an interest in the street-car system. But the people have the greatest interest in them. The street railways have built up Chicago in a great measure to what it is now. Look back 12 or 13 years and see the difference between the conditions then and what we have now. You can remember—or some of you can remember—the little horse cars we



SUSPENSION BRIDGE FOR TROLLEY LINES AT NIAGARA.

tical site, nearly 50 years ago, a suspension bridge was built. The old bridge, however, was of wood, whereas the new bridge is of steel. The old bridge was wrecked by wind February 1, 1864, since which time there has been no crossing facilities at that point, and, in fact, none were needed, for the anticipations of the early-day promoters were not realized. Now, however, the trolley has become a great feature in the development of the Niagara region, and this bridge will form one of the links in a belt line electric-car service about the ever-beautiful Niagara Gorge.

This new structure has been described in the Western Electrician. It will be recalled that the cable span is 1,040 feet, and the suspended span 800 feet. The width of the roadway is 25 feet, and through the center will run a single track for electric cars, with driveways on either side. The height of the bridge above the water is 65 feet, and it is about 15 feet above the tracks of the Niagara Gorge railroad. Long approaches lead to the bridge on either side of the river from the north, and these approaches will be

lines and plant of these companies were leased to the new Chicago Union Traction company—or, rather, the president and directors, in each case, were directed to make the leases "whenever," in the language of the formal resolution, "the said Chicago Union Traction company shall have complied with the terms of the said lease requiring a deposit of securities to be made with the Illinois Trust and Savings Bank, to secure the payment of the rentals and the performance of the covenants of the said lease by the said traction company."

Mr. C. T. Yerkes presided at both meetings, probably for the last time. He made interesting speeches, which the daily newspapers term a valedictory address. Following are extracts:

I wish to congratulate the stockholders on the profitable condition of the company and the progress made in carrying on the road so that they may turn their stocks into investments. I think it is a proper ending for a great work when the stock can take care of itself. I have put the best efforts of my life into this work, and have received the pleasure of my life from it. I look back with a great deal of pride upon what has been done on the North Side. We've done it against great opposition, and we have had to fight for everything we obtained.

had then, with straw on the floors in the winter, for heating was not thought of in those days. And you can remember how we threw away our horse cars and put in the cable, spending millions in making the improvement. And then you know how we put in electricity.

I am proud to think of what we have done. I do not care for applause or praise. A man praises you to-day and very likely curses you to-morrow.

We have made many improvements, but the thing is not perfect by any means.

They talk about municipal control of the street railways, and they refer to Glasgow as an example of that system in practice. Well, I can only say that when we have as good men in office and as competent city officials as they have in Glasgow it will be time enough to think about city control. But you have not that kind of men in this city now.

Mr. Yerkes still retains his holdings in the Chicago Consolidated Traction company, which includes the outlying surface feeder lines of the North and West Sides, and he also has his controlling interest in the Union Elevated Railroad company, in the Lake Street Elevated Railroad company and in the Northwestern Elevated Railroad company. The new traction company is considering the acquisition, by lease, of the Consolidated Traction company. This step, when taken, will probably in-

volve the purchase of the Yerkes holdings and his absolute retirement from the surface lines of Chicago. The completion of the Northwestern elevated railroad will, it is predicted, be a signal for the resumption of negotiations looking to the consolidation of the elevated properties, the purchase of Mr. Yerkes' holdings in them and his retirement from all traction interests in Chicago. In due course the directors and officers of the West and North Side companies will resign to the new company, and their places will be taken by men representing the Chicago Union Traction company.

The new company has, it is stated, a capital stock of \$32,000,000, of which \$12,000,000 is to be preferred. All of the preferred stock has been subscribed, and the money received from this sale will be used to retire Mr. Yerkes' holdings. It is said that Egbert Jamieson, until now general counsel of the North Chicago company, will probably be the president of the Chicago Union Traction company, with John M. Roach, also of the North Side system, as general manager of the consolidated system.

Lowering Heavy Electrical Machinery over the Niagara Bank.

The Niagara electrical fraternity witnessed an interesting feat a few days ago, when the field of the large new generator made by the Walker company for the Buffalo and Niagara Falls Electric Light and Power company was lowered over the high bank to the central station of the Niagara Falls Hydraulic Power and Manufacturing company below. This field weighed about 17½ tons, and the lowering it over the cliff proved quite a task.

Upon its arrival at Niagara Falls it was switched onto the Central tracks, near the canal basin, and taken off the car and moved toward the edge of the

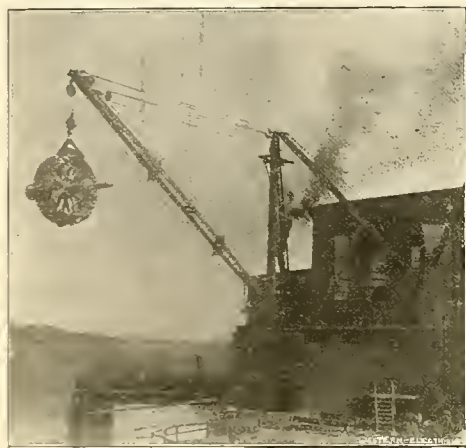


FIG. 1. LOWERING HEAVY ELECTRICAL MACHINERY OVER THE NIAGARA BANK.

bluff, just to the south of the lower works of the Pittsburg Reduction company, and north of the Cliff paper mill, where a large derrick is stationed for lowering machinery over the bluff. The field was made fast to the derrick boom and then raised in order to clear the low roof of one of the Cliff Paper company's buildings. It was then swung out over the high bank to the position shown in Fig. 1. It was then found to be impossible to swing the derrick boom any further around in order to get the field over where it was desired to drop it. An examination revealed that the bed of the derrick was broken, and it was necessary to return the field to the high bank. This was done, and three days later the attempt was repeated successfully, this time the field being placed in the power station in safety. It was the largest single piece of machinery ever lowered over the cliff, but the derrick had picked up heavier combined weights. The safe arrival of the field in the power house relieved many fears.

Incidentally, it may be remarked that in Fig. 2 may be seen a new aluminum bar running up the big penstock. This bar carries current for the operation of an alloy works on the high bank, where a small amount of power is used.

Poles and Wires in Private Alleys.

It is laid down in some of the authorities that the erection of electric light poles by city authorities for the purpose of lighting the public ways and places is not a taking of private property for public use, even though the ground that the use of the streets for this purpose is in the nature of an exercise of the police power of the city. But when an electric-light company erects poles or strings wires, not for the purpose of lighting public ways and places, but for the purpose of supplying light to private individuals and firms for the satisfaction of its own corporate and commercial interests, the Supreme Court of Illinois holds, in the recently decided case of Carpenter against the Central Electric company, such erection of poles and stringing of wires constitute an additional easement on the public way or private alley, for which the owner is entitled to demand compensation.

The Supreme Court states that it has been

said that the legal relations of electric-light wires, through the streets of a city must be analogous to those of gas pipes, upon the ground that both the electric-light wires and the gas pipes are means of furnishing light from a central source of supply, and that, if the laying of gas pipes in a city street is not an additional servitude on the land of the abutting owner, the same should be true of laying tubes for electric-light wires, or placing posts in the ground for carrying the wires overhead.

This doctrine, however, the court continues, applies only to such public streets and alleys as are under the control of the municipality, and where the light to be transmitted by the wires or pipes is for the benefit of the public, as well as of property owners, along the line of the street. The doctrine, it insists, can have no application to a private alley where the fee of the ground in the alley is in the abutting owners, and where the easement, consisting of the use of the alley, is confined to a limited number of property owners, whose lands abut upon the alley.

Power at the Paris Exposition.

By JOHN T. BRAMBALL.

The decision of the Paris Exposition management to establish an electric power plant upon the contracted space of the exposition grounds is disappointing to those who believe that the seat of energy of this great exposition, which shall stand as the demonstration of the world's progress in the arts and sciences at the close of the nineteenth century, should itself be a worthy exponent of the engineering skill of the age.

What, then, should the Paris power plant of 1900 be like? Certainly not fashioned after those that preceded it, for that would confess inability to make further progress. It should mark a distinct advance upon the World's Fair at Chicago.

Looking back at the three American international expositions—New York, 1853, Philadelphia, 1876, and Chicago, 1893—as well as those of London, 1851, Paris, 1867, and Vienna, 1873, it is not difficult to associate the grand productions of inventive genius with the accelerated progress in the mechanical arts which followed in the next decade. But, to consider solely the subject of power generation, the Crystal Palace in New York was ill-provided in that respect. America's industries in 1856 were still of the infant character, and the greater part of the machinery was imported from English workshops. The New York Tribune's reports of the exhibition, as edited for republication by Horace Greeley, devoted a hundred times the space to agricultural machinery (and indeed there was not much else) that they gave to the steam engine. Only one of these was mentioned as a primary motor, and this was dismissed with the following description:

The beam engine, from Providence, by Corliss and Nightingale, exhibits a new application of governor * * *. The workmanship and the ingenuity displayed in this machine are above all praise. As to its practical utility only experience can decide.

The Paris Exposition of 1867 was not remarkable for its machinery, but was noted by Geddes as the first world's fair to show processes of industry in action. The best example of transmission of power, according to the report of the American commissioners, was a "telodynamic" (wire rope) machine from Germany, capable of transmitting 120 horse power 400 feet, and a "hydro-aero dynamic wheel" (compressed air) from Belgium, which transmitted nine horse power 600 feet, and was thought capable, under favorable conditions, of developing 15 horse power. The prime-power engines, though more numerous, did not differ materially from those of the London exhibition of 1851, except that there seems to have been, according to the report of Special Commissioner Auchinclose, a marked adoption of the American model.

In regard to the Vienna Exposition of 1873, the situation is best explained in a paper by Professor James Hart, making comparisons with the Centennial Exposition, then about to open. Professor Hart said:

In the department of machinery, if in no other, the Centennial ought to eclipse all its predecessors. It is in the power of our manufacturers and inventors to make a display of machinery at Philadelphia that shall throw London, Paris and Vienna completely in the shade. This utterance is not the outpouring of enthusiastic patriotism; it is based on a careful study of the Machinery Hall at Vienna. There were more "inventive brains" in the little section occupied by America than in all the rest of the huge Machinery Hall. By the side of our ingenious contrivances, that did their work with such economy of space and force, and with such precision, the cumbersome structures from Germany, France and even England, seemed 20 years behind the times. In this connection America may lay claim to a unique distinction. Mr. Corliss was the only person who received a diploma of honor without being an actual exhibitor. But in truth the entire Machinery Hall, with its appointments, was his exhibition, for every stationary engine at work in the building or on the grounds was in principle a Corliss engine.

Grandly did the builders of the Centennial meet the hopes of its promoters and its friends. London, Paris and Vienna were indeed surpassed by the long lines of busily working machinery, which stretched away along the lines on either hand, all receiving their energy from a single master engine. The Corliss 1,000 horse-power giant of 1876 was, in itself, the first world's fair power plant.

But 1893, the occasion of the Columbian quadri-centennial, saw another great step taken in the dominion of mind over matter, in the great central power plant, which, from the Brobdingnagian battery of boilers adjoining the Palace of Mechanic Arts and the silent cyclopean Corliss of 3,000 horse power, transmitted power and light through the agency of

ponderous dynamos to every part of the capacious grounds of the exposition. Nor was this all. Not only were there no visible wires and no shafting and belting beyond the central plant itself, but there was no visible fuel supply. The power seemed to be produced by magic. There was smoke, indeed, from the great stacks, but no coal. The fuel was pumped from the oilfields of Ohio, 200 miles distant, and automatically fed to the furnaces in Jackson Park.

And now, what of Paris in 1900? Oil or gas being unavailable as a steam producer, must she go back to the antiquated system of shoveling coal beneath the great boilers that are to supply steam for her power plant on the Seine? Must great piles of coal obstruct the Champs de Mars, and boats take cargoes of ashes at the Pont de Jena? Must huge chimneys belch forth smoke to sully the white walls of the Trocadero and smut the fine fabrics in her Palais de l'Industrie? It is to be hoped that the Queen City of the world will never consent to such a confession of weakness. What then remains?

The Schaffhausen-Frankfort experiment demonstrated the possibilities of long-distance transmission of power, which was confirmed by the Niagara-New York experiment. While neither was practically satisfactory from an economic point of view, they were as scientifically successful as was the telephone at Philadelphia in 1876. It now remains for France to outdo the achievements of Germany and America in the practical transmission of power, and to proclaim to the world that France celebrates the closing of the century with a feat of engineering worthy of the event and of herself.

The problem, though new, is not a difficult one

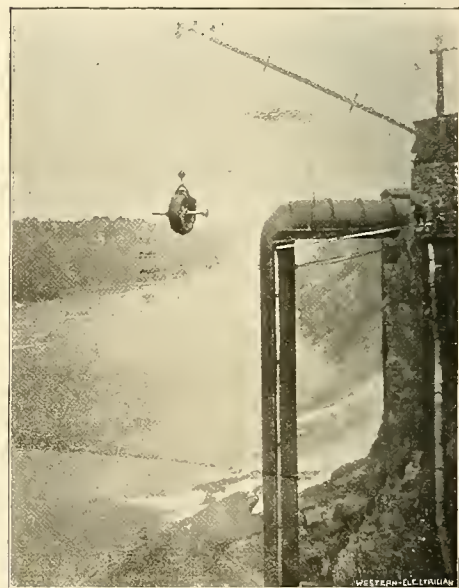


FIG. 2. LOWERING HEAVY ELECTRICAL MACHINERY OVER THE NIAGARA BANK.

for engineers. In the coal mines of Du Nord and Pas-de-Calais, within 100 miles of Paris, are great stores of energy which modern science may transmit to Paris or to the Mediterranean, if necessary, by electricity. By establishing the power plant at the mines instead of at the exposition itself, many economies are effected, which more than offset any increase in cost of the plant and the losses in transmission. Not only the cost of delivering coal would be saved (it is 1.8 cents a ton per mile on French railways), but the "run of the mine" being used, the first cost of fuel would be far less. At the exposition grounds valuable space would be gained for exhibits; the handling of coal and ashes would be avoided in crowded streets and grounds; the smoke nuisance would not worry exhibitors, and the fire risk would be materially lessened. These are important features to be taken into consideration when the matter of economy is discussed.

The feasibility of conducting high potentials such a distance, or even greater, with a practical efficiency need be no longer questioned. The Niagara electrical engineers place the economic limit nearer 500 miles than 100. As to cost of plant, the conductors would furnish the heaviest item, but the copper or aluminum should not be charged on the account as a permanent investment, since the value of the metal does not deteriorate by use. Indeed, it is not unlikely that the successful operation of the plant would encourage sufficient patronage from city consumers after the close of the exposition to warrant its continuance and extension, and thus stand as a model to London, Chicago and other great cities in the matter of the abolition of the smoke nuisance.

Nearly three years ago the suggestion was made by the writer to the directors of the Paris Exposition of 1900 of a plan for the generation and transmission of power as thus outlined, and the proposal, coming from this country, and originating, in a sense, with the Chicago Exposition, its adoption would add to the record of London (1851), Paris (1867) and Vienna (1873) another laurel wreath for America.

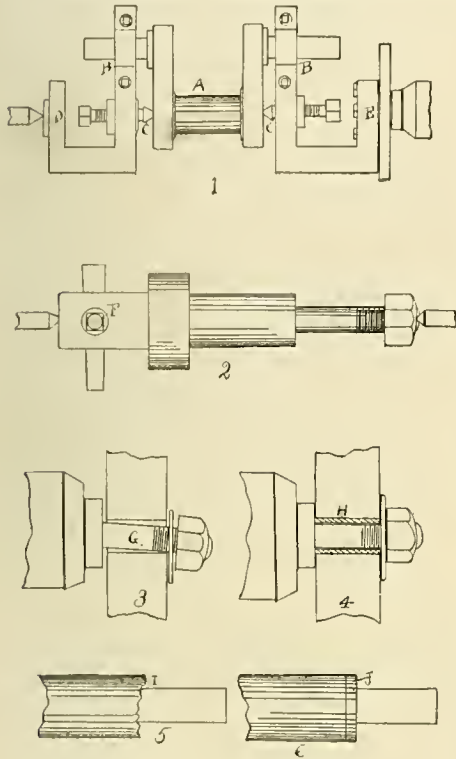
A Few Practical Suggestions.

By L. F. SIMDELL.

A center crank was recently made true by the home-made rig designed as in Fig. 1. The crank was used between a motor and a plunger pump. The service rendered was very ineffective, due to the improper alignment of the yoke and wrist pin. The yoke wobbled badly and communicated the jarring motion to the motor and to the flywheel of the pump, resulting in loss of power, irregular work and bad service in general. In making these cranks, for use in crank-and-flywheel electrically driven pumps, the practice is to rough out the crank-shaft, slot the yoke as far back as the wrist-pin and then turn the latter true in a special rig. In the event of the shaft or yoke springing or anything occurring to disturb the alignment of the crank after it is in service, it may be necessary to turn the crank-pin on center cranks again. The rig in Fig. 1 may be used for this purpose. The brackets (BB) are cast-iron, and are bored at the upper projections to receive the ends of the crank-shaft, as shown. This will bring the pin at the center (A), opposite which point the centering pins (CC) are provided in the bracket. We now have the crank-shaft in a turning center, and it is secured in the turning lathe by holding the part (E) to the face plate, while the arm of the opposite bracket (D) is centered on the turning point. The work is now in position for turning, and, with the proper tools, the pin can be readily trued.

SWITCHBOARDS.

In Figs. 2, 3, 4, 5 and 6 are shown shop methods for turning, truing and putting switchboard connec-



A FEW PRACTICAL SUGGESTIONS.

tions into order. It is a commendable practice to make inspections of the switchboards to ascertain whether the proper adjustment has been lost through the wear or fracture of any of the supports. Sometimes the shoulders of the supporting studs become worn, or the stud itself becomes bent, allowing the switchboard to settle and lose its alignment. As is known to electricians, it is necessary that all rheostat fittings must be perfect. When dynamos are operated together, a rheostat connection may give out unexpectedly and cause the loss of an armature. Fuses or circuit-breakers are provided on each feeder leaving the switchboard, but unless the corresponding parts are in perfect operating condition, serious trouble may arise.

In examining a switchboard that gave trouble through the repeated failure of shunt-field connections, I found that some of the fastenings employed to secure rheostats to the back of the switchboard were untrue and generally imperfect. I removed these and trued the pins by placing each in a turning latch between centers, as in Fig. 2. After locating the irregularity, I secured the base end to the face plate and turned off sufficient metal to reduce the pin to an even condition. A key was used to secure the base pin in place, but most of these keys were found to be loose, and failed to answer the purpose intended. This was rectified by boring a set-screw hole opposite the key and providing a small set-screw (F), the point of which was forced against the key, holding the latter firmly in place.

Some of the switchboard connections were found in the shape shown in Fig. 3, in which the supporting bolt was too small in diameter to fill the hole in the board. The board was therefore shifty at that end. This defect of workmanship was fixed by providing metal sleeves (H), Fig. 4, for the loose bolts.

It is hardly necessary to inform electrical men that fire-insurance inspectors are more particular than formerly and that more thorough inspections are made of even the smallest details of switchboard construction. A new switchboard, just from the manufacturer's, is usually in good condition, and the inspector is usually satisfied with a casual examination to make sure that the switchboard is located 12 inches from combustible stuffs, or separated therefrom by the proper non-inflammable insulating materials; that the fittings are electrically and mechanically perfect; that the lightning arresters are properly provided for; that there are no kinks or coils in the wires between the outdoor lines and the arresters; that drops and jacks are in good working order, and that the board itself is properly designed, mounted on hard rubber or other substance and correctly set and wired. But when the inspectors examine boards that have been in service a number of years they are more careful to locate defects, as they are aware that switchboards, like other apparatus, are subject to the influences of mechanical and electrical strains, as well as ordinary use. Often a little mechanical skill can repair the effects upon shoulders of studs, and pin supports. Fig. 5 shows a badly worn shoulder at (I). It may not be convenient to replace the pin with a new one, and the old one can be made useful again by turning off the worn portion in the lathe and shrinking on a ring, as at (J), Fig. 6, to make up for the metal removed.

THE USE OF THE FILE IN ELECTRICAL WORK.

The proper use of the file in ordinary filing operations in the electrical repair and construction shop is of such importance, and the tool is so frequently incorrectly handled on delicate parts of motors and switchboards, that a few suggestions and illustrations may be serviceable. The electrical machinist is obliged to use the file on iron, steel (soft), copper, brass, marble, slate, porcelain, ivory, hard rubber, etc. In filing a flat surface, as in Fig. 7, the tendency is to depress the file at each stroke, as per the dotted lines, so that after filing a short time the center (B) will be higher than the edges (CC). In order to avoid rounding off the edges at (CC) several points have to be considered. Some endeavor to overcome the trouble by using very short files, files of large cutting capacity, square files, etc. An ordinary flat file of from 12 to 18 inches length is best, and, with a straight edge at hand to test the edges frequently while filing, the strokes may be given the file with one hand grasping the handle of the file and the other supporting and steadying the point. An equal pressure is necessary, and depressing the file at either end must be avoided. To file a key-way the same rules apply to avoid taking off the edges at (DD), Fig. 8. The file should be the square or pillar pattern, and provided with safety edges to cut downward, and with edges to suit the conditions, if it is desired to cut the sides of the key-way.

In filing curved work, as in Fig. 9, some electrical machinists make the mistake of using a round file, like (E). It is impossible to get a true curve with the small round file, even if it is skillfully moved over the surface from right to left and the reverse at every stroke. The half-round file (F) should be used, but not as some use it. The method of applying the strokes to one place until a certain depth is obtained, and then proceeding to another point, does not result in uniform work. The best process is to sweep the file from (H) to (G), Fig. 10, and vice versa, continually, with the forward and backward strokes, taking off metal in the entire curve each time, thus gradually reducing the curve to the required dimensions. This causes the file cuttings to cross each other and produce much truer results than in the former plan.

It frequently happens that the electrical machinist does not possess the file required with the safety edge on the right side for the work in hand. If an attempt is made to reduce a flat surface next a shoulder with a file provided with all its edges, the shoulder will, of course, be cut into, as at (I), Fig. 11. If no file is at hand with a safety edge on that side, the same file may be smoothed on that edge by holding it on the emery wheel a few minutes. The proper surface can then be filed without abrading the shoulder. If a half-round file is used for this purpose, the shoulder will be cut into, as at (J), Fig. 12. If a circular cavity or recess is wanted in the flat surface near the shoulder, it will not do to use a round file, as such a file will cut both ways, sinking the recess into both surface and shoulder, as at (L), Fig. 13. The remedy consists in holding the file on the emery wheel until a safety edge is made at (P), Fig. 14. The recess may then be cut with safety.

Lord Kelvin's Genius.

[Professor Oliver Lodge in the Liverpool Post.]

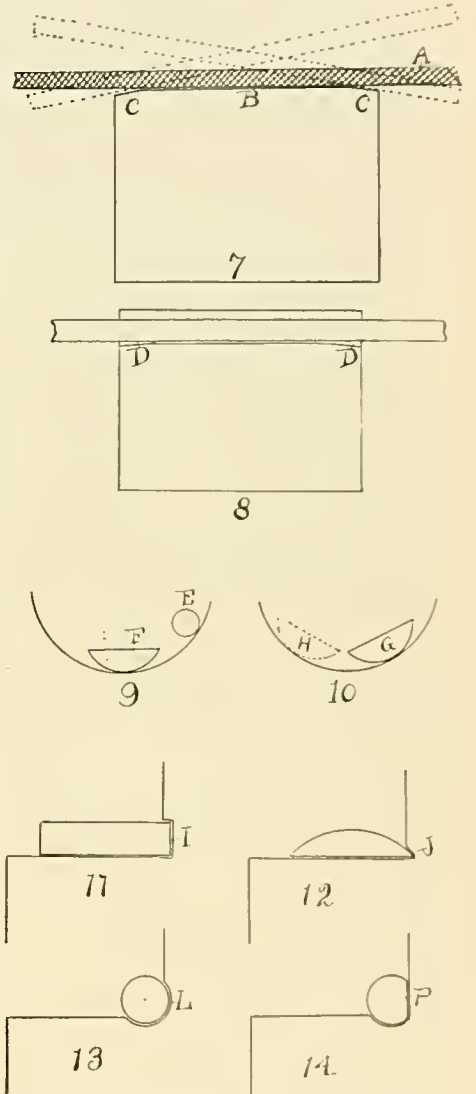
The modern theory of electricity, developed so brilliantly by Clerk Maxwell, was begun by him (Lord Kelvin). The science of thermodynamics owes much to him; the theoretical laws of thermoelectricity were wholly worked out by him; and to him long ago is due the theory of those electric oscillations which were elaborated practically by Hertz, and have recently been exciting some popular interest as affording a method of wireless telegraphy.

In the higher regions of optics also he has worked much, and in his Baltimore lectures and elsewhere has striven to unveil the mystery of the connection between ether and matter, as revealed in the facts of radiation, fluorescence, phosphorescence, selective

absorption and dispersion. The definition and the experimental determination of the absolute zero of temperature are both due to him. The vortex theory of matter constitutes one of his most brilliant but incompletely worked out speculations. The kinetic theory of its elasticity and rigidity is a definite contribution to that view of the physical universe which seeks to resolve the whole of merely material existence into the two fundamental entities—ether and motion. Let anyone ask what is the size of an atom, and he is referred to Lord Kelvin.

Let him ask what is the age of the earth, and if he mean anything definite by this question—if he mean, for instance, what time has elapsed since the earth was a molten mass beginning to cool—it is again to Lord Kelvin that he must go. And then the tides; all the higher mathematical work on the tides, with their various causes and perturbations, is based on Kelvin's pioneering work, and to him all writers on this abstruse subject look up and defer as their master.

Happy in the circumstances of his education, pertinacious in his unwearied industry, and undistracted by other interests from a constant devotion



A FEW PRACTICAL SUGGESTIONS.

to definite dynamical science, narrow perhaps in some of its aspects, but all the more intense for that, he stands before us now a monument of human power and influence, one of the benefactors of the human species, one who has been happily preserved with hardly diminished energy for nearly 60 years of peaceful, epoch-making work, one on whom posterity will heap high honors, and will regard with feelings of envy us of the present generation who are still illuminated by his living presence.

Canadian Electrical Association.

At the convention of the Canadian Electrical Association, to be held at the New Royal Hotel, Hamilton, Ont., on June 28th, 29th and 30th, papers are to be read as follows: "Meters," A. A. Dion, Ottawa; "Cost of Power," C. B. Hunt, London; "Inspection," W. J. Plewes, Montreal; "The Enclosed Arc Lamp and Its Use," W. A. Turbayne, Hamilton; "The Incandescent Lamp for Central Stations," E. E. Cary, St. Catharines; "Central-station Accounting from a Business Point of View," P. H. Hart, Montreal; "Transformer Economy," F. E. Leonard, Jr., Montreal. In addition, there will be a "question box," and Mr. H. R. Leyden will lead a discussion on high-tension power distribution. The "social features" include trips to Burlington Beach, (and an excursion on the lake), Grimsby and De Cew Falls, where the large plant of the Cataract Power company is located.

Single-phase Distribution.¹

By HERBERT A. WAGNER.

Each system, single-phase, two-phase and three-phase, has its own particular province where it is supremely adapted to the work to be done. In the transmission of power to operate large motors, both the two and three-phase systems are superior to the single-phase, although time may even modify this condition.

Simplicity is one of the prime requisites in an

conduits and other construction items does not increase in proportion to the cross-section of the copper.

The actual difference in the cost of conductors installed for underground transmission between single and three-phase is almost insignificant. This slight difference can always be made up completely by operating the single-phase at a slightly higher pressure. If the cost of copper alone was considered, the single-phase would have to be operated at a pressure 15 per cent. higher than the three-phase

largely used for lighting, equally loaded at all times, and it is, therefore, impossible to keep the different phase circuits of two or three-phase systems balanced when used for single-phase local distribution, and we have demonstrated that they must, of necessity, be so used in practice.

In either the two-phase or three-phase systems an unbalanced load on the different phases causes an unbalancing of the pressure on those phases at the generator, and consequent difficulty to regulate closely, this being most marked in the three-phase system. In this particular, and in slightly less complication in local distribution, the two-phase system is superior to the three-phase.

It is quite necessary to carefully consider all these characteristics of the three systems in deciding which one to use in any particular case. As I have said, each has a field in which it is the most suitable.

For long-distance transmission, for power or rotary transformers only, the three-phase system is most clearly indicated.

For the same service as just stated, with a small proportion of lighting, the three-phase current may be transformed to two-phase for the latter, or single-phase current may be used from one of the three-phase circuits.

For shorter transmission and general distribution, where rotary transformers are also required, the two-phase system is indicated.

For all general distribution, where rotary transformers are not required, and extremely large motors, starting under load, are not to be supplied, the single-phase system should always be used. For cities, large and small, this class of service is the one usually required, with the exception of cases where it is necessary, in order to conform with long-existing conditions, to supply direct-current mains with direct current from rotaries. Here the three-phase system is, of course, the most applicable.

I have not considered the use of rotaries with single-phase currents, not because their operation is impracticable, but simply for the reason that none of large capacity have ever been made. They can be made, and so made that they will operate as satisfactorily as on two or three-phase circuits. It would complicate them more to make them self-starting by alternating current, but many two-phase rotary installations have been made which are not self-starting. A separate starting device or motor is used, which would be equally as applicable to single-phase circuits. Single-phase rotaries of a given size would have less capacity than two or three-phase, and, therefore, for a given capacity, would cost slightly more. That they will eventually be used quite extensively on single-phase circuits is quite certain.

It was not my intention to digress very far from the subject indicated by my title, but it seemed necessary to clearly define the position and sphere of single-phase work, by way of introduction.

Probably, the best example of pure single-phase distribution on a large scale is furnished by the Missouri-Edison Electric company of St. Louis, and I can best show its possibilities by describing the results obtained by this company. The methods of distribution employed by this company have been so frequently described that they are undoubtedly

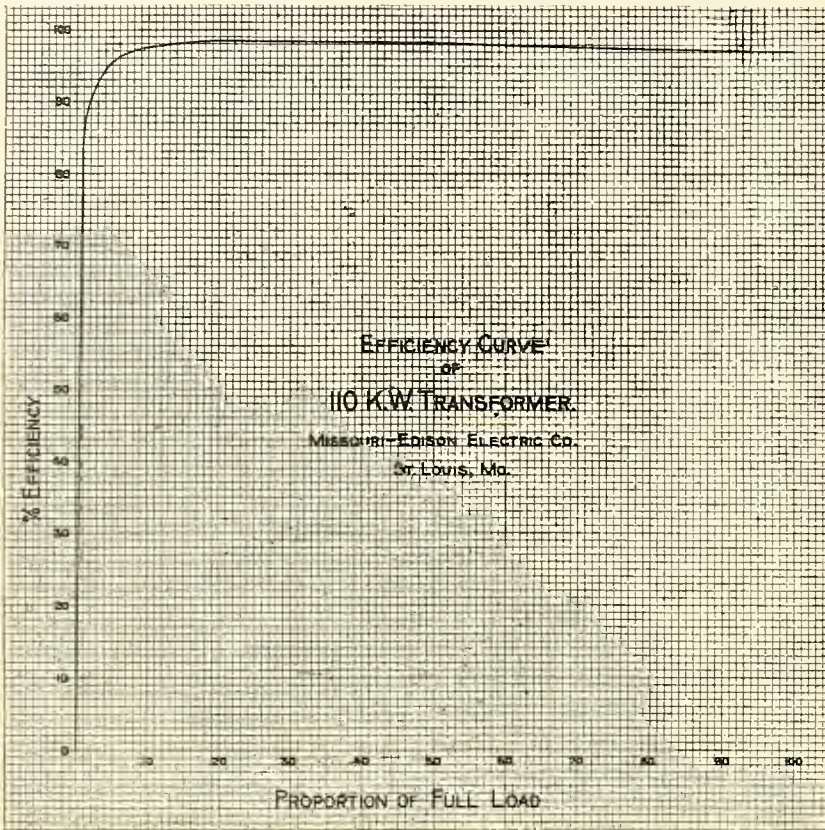


FIG. 1. SINGLE-PHASE DISTRIBUTION.

electrical installation, and the multiplication of parts or members decreases or eliminates it. It is hardly necessary to go into the details of the complications to which polyphase distribution may lead, but of these the multiplication of wires is the very least. The complication of the switchboard apparatus and appliances, and also those used in connection with local distribution and services, is most discouraging.

Consider, for instance, low-tension local distribution mains on the three-phase system in combination with the Edison three-wire system, making six circuits to equally divide your lamps between in such a manner that the balance will be quite nearly maintained at all times, at each or adjacent customers.

In all successful low-tension distribution systems junction boxes are used at street intersections. These are arranged for distribution in four directions, and at feeder terminals and some other intersections are quite frequently six-way boxes. Imagine such boxes with 24 or 36 cables entering them. The neutrals in such a system could never be allowed to ground, as they would all three be at different potentials. It is absolutely impracticable, and the three-phase advocate will answer by saying that he would separate his circuits for general distribution and run his lighting circuits single-phase, using his three phases each for a different district or section of a district. For power customers he would use all three circuits, of course. Now, everyone who operates a large central station knows how impossible it is to separate light and power. Small motors are required by almost every lighting customer. If the solution then is to use single-phase motors for small powers, where is the size line to be drawn? Single-phase motors can be made just as efficient as three-phase. True, they will cost more if so made, but when the saving in cost of transformers and distribution devices is considered, the balance is in favor of the single-phase motor.

It must, of course, be borne in mind that the subject now under consideration is general distribution for all electrical applications, and not for power distribution alone. We might then be advised that we could confine our three-phase system to our transmission line and feeders, where we could save very greatly in the amount of copper required.

For ordinary distribution in large cities the cost of transmission lines or feeders is but a small proportion of the total cost, where alternating current is used. Of this small proportion we are told we can save 25 per cent. But is this true? It is as far as copper is concerned, but the cost of insulation,

¹ Read before the National Electric Light Association, at New York, May 23-25, 1899.

for equal cost. Considering the total cost of line installation, however, this difference would not be over 10 per cent. in pressure for overhead lines, and less than five per cent. for underground lines. Have we ever so nearly reached the safe limit of pressure that anyone could say, "You cannot safely go 10 per cent. higher?" Can we not as safely run 10

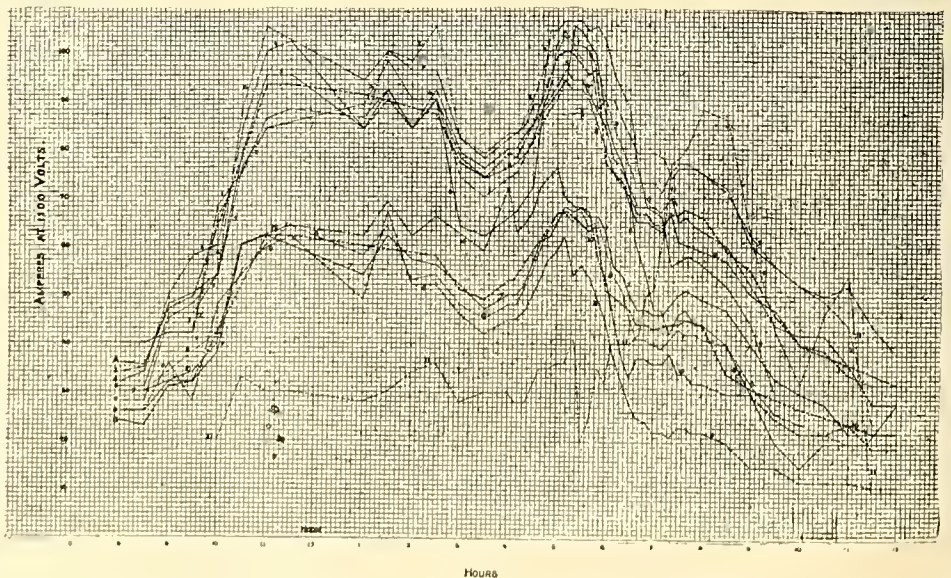


FIG. 3. SINGLE-PHASE DISTRIBUTION.—GRAPHICAL LOG OF LOAD ON UNDERGROUND FEEDERS.

per cent. higher when we have only two-thirds the length of line to operate and practically but two-thirds of the surface in contact with insulation from which leakage or breakdown might occur?

As two-phase distribution requires the same amount of copper as single-phase at the same pressure, it has no point of even apparent superiority, except the debated one of greater adaptability for running motors.

On regulation—and this is a very important factor—the single-phase is far superior to the two-phase or three-phase system. I contend that it is impossible to keep two separate feeders supplying current

familiar to most of you. I will, therefore, mention them but briefly.

In a large portion of the city the usual system of individual transformers for every customer or adjacent customers is used. The current for these transformers is supplied by overhead feeders and distributed over high-tension overhead mains. In some districts one transformer is used to supply current for an entire block by means of three-wire low-tension secondary mains.

The principal business portion of the city is now supplied by underground conductors, covering a district of 40 miles of streets. A low-tension Edison

three-wire network of mains is used throughout this district, and these mains are supplied by high-tension feeders, each of which terminates in a transformer of the same capacity as the feeder. Pressure wires run from the mains near the terminal of each transformer back to the station. Each feeder has a regulator or booster at the station.

From this network of three-wire single-phase alternating-current mains current is furnished for incandescent lamps, arc lamps and motors.

There are at present about 1,000 horse power of single-phase motors in operation, varying in size from one-half horse power to 25 horse power. Many of these have replaced direct-current 500-volt motors, and there is not one that is not giving perfect satisfaction. Current is charged for entirely by meter.

The most novel feature of this system is the transformer, and the method of making it practically a part of the feeder to which its drop is added, and is cared for by the feeder regulator at the station. The pressure wires indicate the pressure on the secondary mains, which can be kept constant, however much the drop in feeder and transformer may vary.

The transformers were designed for remarkably high-average efficiency, and actually show the highest efficiency at about one-quarter load. The specifications for these transformers limited the iron loss to 250 watts, the copper loss at full load to 3,200 watts, and the regulation to four per cent. Thirty of these, of 110 kilowatts capacity each, are in service on as many feeders. They all run slightly under the specified losses. Tests on six of these transformers, picked out at random, are as follows:

TESTS ON 110-KILOWATT TRANSFORMERS.

No.	Loss in Watts.		Efficiencies.		Regulation.	
	Iron.	Copper.	¼ Load.	Full Load.	Per Cent.	Per Cent.
1.....	224	3,199	98.4	96.9	3.50	
2.....	335	3,080	98.4	97	3.44	
3.....	244	3,162	98.4	97	3.44	
4.....	231	3,125	98.4	96.8	3.48	
5.....	250	3,050	98.4	97.1	3.38	
6.....	249	3,125	98.4	97	3.49	
Specifications.....	250	3,200	.....	.....	4	

An actual efficiency curve is shown in Fig. 1. Most of these transformers have been in use for nearly a year, during which time not one has ever been out of service or shown any defect of any kind. The highest recorded load on any one was 130 kilowatts.

Fig. 2 shows a map of the district in which the transformers are used. The full black circles indicate manholes in which transformers are placed at the feeder terminals. The feeders are not shown on the map, the heavy lines indicating only the three-wire system of mains fed by the feeder transformers.

The feeder regulators at the station make it possible not only to regulate the pressure with the greatest precision, but to divide the load between the feeders and their transformers in any way desired. By slightly lowering the pressure on one feeder, and slightly raising it on an adjacent one, a large proportion or all of the load of the first can be transferred to the second without sensibly altering the pressure on the mains. This operation is almost identical to that of dividing the load between two direct-current generators running in parallel. All feeders can be kept almost equally loaded in this way, if desired.

Fig. 3 shows a number of load curves of feeders operated in this way. It will be noticed that the fluctuations in load on feeders Nos. 1, 2, 3, 4, 5, 6 follow each other very closely, and that several are extremely close to curve A, which is the total load curve for this district, plotted at one-tenth scale. These feeders were not operated at this time to divide the load as closely as possible, but to give the best pressure regulation. Both conditions are very fairly met, however, at the same time. Curves 7, 8, 9, 10 are for a portion of the district somewhat separated from that of the first curves noted on the higher portion of the scale, but, grouped as they are, they agree very well between themselves and curve B, which is the total district load, at one-fiftieth scale. Curve 11 follows a path which seems quite erratic, but its principal load is two theaters, and at this time it was feeding a few blocks of mains which were completely separated, temporarily, from the rest of the system. Its lack of conformity to the other load curves shows very forcibly the advantages of an interconnected system of mains.

The load record for this particular day was selected for these curves, as illustrating unusually well the relative load variation on different feeders. The day was an unusually dark one, and was also a matinee day for the theaters. At half past 11 in the morning the total load in the business district reached within seven per cent. of the maximum at the time of the usual peak. The fog began to lighten slightly until one o'clock, when it again grew darker until half past. The relief during the next half hour was checked somewhat in effect by the theater matinees.

It is our custom to plot quite frequently curves of this kind, showing loads on all feeders in a district, for the purpose, among others, of establishing the best pressure wire to adopt for a period as standard for general regulation. The bus-bar pressure is always regulated by the indications of this standard pressure wire, and the individual feeders whose pressure departs from the standard, up or down, are regulated independently, from time to time, by their own regulators.

The effect of a slight drop in pressure on one feeder in transferring the load from that feeder to an adjacent feeder or feeders is shown by the curves

in Fig. 4. Here the pressure on feeder No. 1 was dropped 1½ volts. Feeders Nos. 2, 3 and 4 promptly took their proportion of the load, leaving feeder No. 1 practically without load. Feeder No. 1 could then have been cut out and taken out of service, if desired, leaving the portion of the district about its terminal 1½ volts low in pressure. This is on the assumption that the other feeders were allowed to remain at their original pressure; but by means of their regulators the pressure of each or any one could be raised slightly and the pressure at the terminal of No. 1 could in this manner be brought to approximately the normal figure, with only a slight raise at the terminals of the other feeders. All feeders are provided with fuses at the station

load indicated, showing that the junction box fuses had also been blown, completely separating the feeder from the system. The voltmeter connected with the mains adjacent to the terminal of the disabled feeder then showed the pressure at that point to be slightly less than two volts below the normal. It was found to be necessary, however, to raise three adjacent feeders but one-half of a volt each above the normal to bring the pressure of the first named point about right. Absolutely no inconvenience was observable in the operation of the system, and no complaints were received from any customer. This feeder happened to be one of the most isolated of all our feeders, and one supplying individually a far greater proportion of the district than any

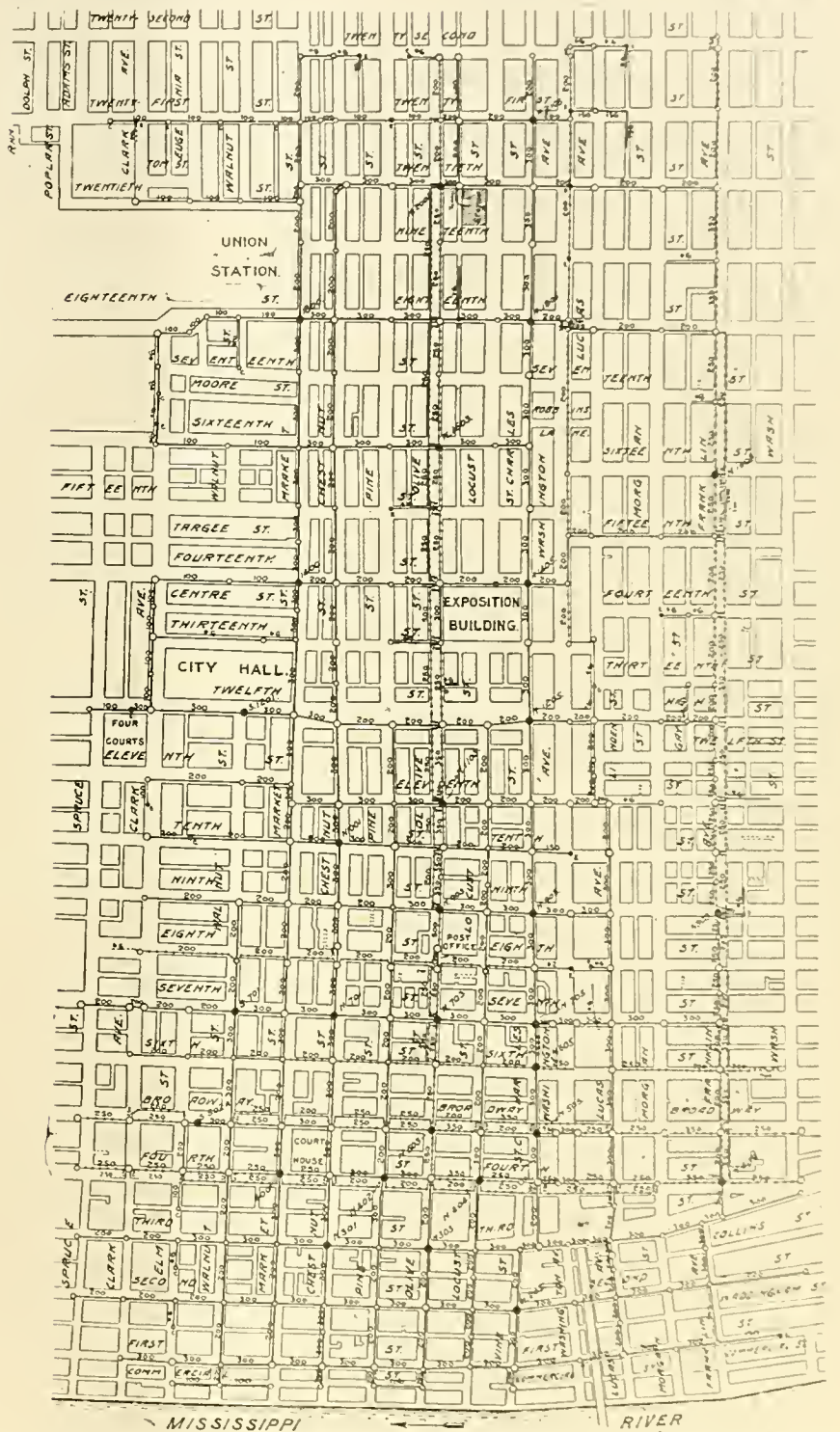


FIG. 2. SINGLE-PHASE DISTRIBUTION.—MAP SHOWING UNDERGROUND DISTRICT IN ST. LOUIS

end, and the secondary terminals of each transformer are led into junction boxes provided with copper fuses. These fuses are intended to protect the rest of the system in case of any defect developing in a feeder or its transformer. We have, thus far, had but one such accident, but this, of course, had to occur at the time of maximum load. A defective joint in a two-conductor feeder cable developed a short-circuit about three blocks from the feeder end. The first indication was given by the feeder-ammeter index trying to knock out the side of its case. This was almost immediately followed by the blowing of the feeder fuse at the station. The next thing noticed was a great activity on the part of the ammeters on adjacent feeders. They soon settled down, however, with a slightly increased

other, being the one shown on the map terminating at Third and Chestnut streets.

The method of eliminating the effect of transformer drop by making it a part of the feeder renders it possible to regulate, with a system of interconnected mains and the use of pressure wires, as closely as in a direct-current system; and the use of individual feeder regulators enables the pressure to be adjusted with the greatest precision. The uniformity of pressure obtained in the actual operation of this system is shown by the recording voltmeter chart in Fig. 5. This chart was taken from a voltmeter situated about 6,000 feet from the station and about 500 feet from a feeder and pressure-wire

[Continued on page 331.]

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CORRESPONDENCE relating to electricity or any of its practical applications is cordially invited, and the co-operation of all electrical thinkers and workers earnestly desired. Clear, concise, well written articles are especially welcome; and communications, views, news items, local newspaper clippings, or any information likely to interest electricians, will be thankfully received and cheerfully acknowledged.

ADVERTISING.—THE WESTERN ELECTRICIAN—the only general electrical paper published in the West—thoroughly covers a territory exclusively its own. THIS IS A CLAIM WHICH CAN BE MADE BY NO OTHER ELECTRICAL JOURNAL IN THE UNITED STATES. Electrical merchants and manufacturers desiring western trade will appreciate the UNEQUALLED VALUE of this journal as an advertising medium in its special field. Advertising rates are moderate, and will be furnished on application.

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CONVENTIONS AND EXPOSITIONS.

International Electrical Exposition in Commemoration of Volta, Como, Italy, May 20th to October 25th. (The date of the festival of the centenary of Volta at Como is fixed for September 18th.) American Institute of Electrical Engineers, Boston, June 26th to 29th.

American Society of Civil Engineers, Stockton Hotel, Cape May, N. J., June 27th to 30th.

Canadian Electrical Association, Hamilton, Ont., June 28th to 30th.

Southern Telephone Association, Memphis, Tenn., July 5th.

American Association for the Advancement of Science, Columbus, O., August 21st to 25th.

International Meteorological Committee, St. Petersburg, August 25th.

National Association of Municipal Electricians, Wilmington, Del., September 5th and 6th.

Philadelphia Exposition of American Manufactures for Export, September 15th to November 10th. (Under the auspices of the Philadelphia Commercial Museum and the Franklin Institute.)

American Electro-therapeutic Association, Willard's Hotel, Washington, D. C., September 17th to 21st.

Chicago Exposition of Electrical Arts, Tattersall's, September 25th to October 9th.

International Exhibition of Motor-Vehicles, Berlin, Germany, during September.

American Street Railway Association, Tattersall's, Chicago, October 17th to 22th.

At the meeting of the International Meteorological committee at St. Petersburg, on August 25th, Professor Rücker of England will submit a report on "Terrestrial Magnetism and Atmospheric Electricity," and W. von Bezold of Germany will read a paper upon "Protection of Magnetic Observatories against Industrial Electrical Works." The latter subject, it will be remembered, was discussed at the international conference at London last year. The meeting will be attended by the most distinguished specialists in this line, and will be of an official character. The United States will be represented by Willis L. Moore, chief of the Weather Bureau.

Mr. Yerkes' retirement from the active management of street-railway properties in Chicago is an important event of more than local significance. Mr. Yerkes has been a powerful factor in the development of modern street-railway practice. The properties under his control were extended and their values greatly enhanced during his management. In some respects Mr. Yerkes is a remarkably able manager, but his unfortunate faculty for antagonizing the public and disregarding the convenience and comfort of his patrons accomplished his downfall. During the last few years he displayed a bitterness and resentment against those who opposed his projects that revealed a weakness not suspected in his earlier operations. In retiring Mr. Yerkes expresses his satisfaction at the conclusion of his labors in Chicago, and there seems to be no disposition on the part of the public to detain him. Let us hope that he will find a more congenial field of operation elsewhere.

The practice of endowing educational institutions has not extended to engineering schools in this country, excepting in a few notable instances. For this reason the announcement of the intention of Andrew Carnegie to donate \$50,000 to Stevens Institute for a new engineering laboratory will be of particular interest. President Morton and the trustees had the building of the laboratory in mind for some time, but were unable to start the work on account of a lack of funds. President Morton explained the situation to Mr. Carnegie some time ago, but at the time received no assurance of assistance. It is evident, however, that the conversation made an impression upon Mr. Carnegie, for on Saturday last President Morton got a letter from Mr. Carnegie, who is in Scotland, saying that it would give him great pleasure to donate \$50,000 for the building of new laboratory. President Morton said that the plans for the new laboratory would be prepared at once, and that when completed it would equal or surpass those of Cornell, Columbia and the Massachusetts Institute.

Modern science bears witness to the wisdom of our forefathers and grandmothers, whose injunction, "Don't worry," if heeded, might have prevented much of the physical suffering, as well as mental anguish, that has been visited upon poor humanity. By the aid of the X-ray it has been determined that worrying stops digestion, causes dyspepsia, retards all the normal physical processes and demoralizes both body and mind. It wastes the forces of life, destroying the tissues without accomplishing anything. It has long been admitted that to worry is to fire into the air instead of at the enemy, but it has never been fully understood just how care and anxiety accomplished so much ruin. Now, however, all has been made clear by the investigations conducted by Dr. Fritz Lange of Munich, through the use of Crookes tubes and fluorescent screens. The X-ray was turned upon the stomach of a happy and contented cat, and the investigator was enabled to witness the process of digestion going on as it should in all well-regulated stomachs. Then he introduced care and irritation into the feline mind by placing a live mouse just beyond reach, and, he declares, digestion was stopped thereby. In spite of Dr. Lange's demonstration, however, it is greatly to be feared that we will go on worrying just the same, and suffer the consequences.

When the announcement was made several months ago that the Navy Department had determined not to extend the use of electricity on board ship, the Western Electrician expressed surprise and urged a reconsideration, believing that such a decision would be detrimental to the department and would retard the general adoption of electrical appliances in the merchant marine. It was difficult to understand the

mental process by which the decision of the Navy Department was reached, in view of the enthusiastic reports that were made upon the performance, during the Spanish war, of the electrical apparatus with which the latest vessels had been equipped. Now, it transpires that the whole trouble was the outgrowth of a factional dispute between two of the bureaus or branches of the service. A Washington dispatch last week announced that one of the causes of friction between the members of the Naval Board on Construction was moved by an agreement of the board that all deck winches on war vessels, except battleships, shall be run hereafter by electricity, and that the question of the use of electricity for operating them on battleships will be taken up later. The Engineer Corps of the navy has insisted that the winches shall be run entirely by steam, and, in consequence of its determined attitude, the board got into a tangle.

The dispatch continues: "The question may seem of little importance to laymen, but it caused a great deal of trouble at the meetings of the board. It is to end such internal controversies that Secretary Long has appointed a board, with Assistant Secretary Allen as president, to harmonize the differences between the various naval bureaus in regard to work on the construction and repair of warships."

It is greatly to be regretted that decisive action was not taken several months ago, as the battleships now building might have been furnished with electrical equipment. Now, however, there is reason to believe that by the time they are ready for service this part of their equipment will be antiquated. It has been the boast of the American navy heretofore that it has been a pioneer in the adoption of improvements in mechanical equipment, but now it must be admitted that a step backward has been taken deliberately and in the face of the most convincing proof of the error contemplated.

A remarkably favorable showing, unprecedented in the history of American export trade, appears in the statistics just prepared by the United States Treasury Department showing the exports of electrical machinery during the 10 months ended April 30, 1899. During that period the total exports in this line aggregated \$2,276,694, as against \$1,702,812 for the same period of last year. Under the classification of instruments and apparatus for scientific purposes, in which are included telegraph, telephone and other electrical apparatus, a still larger increase is noted, the exports in these lines during the 10 months of the current fiscal year amounting in value to \$3,537,993, as compared with a value of \$2,324,307 for the preceding 10 months.

The natural inference from these figures is that electrical manufacturers of this country have demonstrated their ability to compete with those of other countries, not only in neutral markets, but in the home markets of the more advanced industrial nations, particularly the United Kingdom and Germany. The electrical industry of this country has, in fact, been developed to the point where it seems to be not only practicable, but comparatively easy, to supply a considerable portion of the outside world as well as the home market. The conditions of manufacture in the United States to-day favor successful competition in foreign markets in many lines in which, at one time, we were exposed to the rivalry of foreign industries.

The observations of United States consuls in European countries and elsewhere encourage the belief that American manufacturers have a distinct advantage in the greater ingenuity of their operatives and in the economy of labor-saving machinery over foreign competitors, and that the obstacles they have to overcome are chiefly those of the special trade methods of different countries, the longer credits given by European exporters and occasional government discriminations by foreign nations against them.

It is very evident that the export of electrical machinery and appliances is no longer a matter of experiment, but that our large manufacturers have satisfied themselves that it is feasible to dispose of their surplus productions in all parts of the world, and have addressed themselves seriously to the study of the conditions which are requisite for healthful and permanent growth. The great increase in the applications to consular officers for specific information and for assistance in introducing American goods affords strong evidence of the general perception of this fact among American manufacturers.

American Institute of Electrical Engineers.

The sixteenth general meeting of the Institute will be held at the Massachusetts Institute of Technology, Boston, on June 26th, 27th and 28th. The meeting of 1890 was held at the same place and was quite largely attended, considering the membership at that time, which was only 540, or less than half the present number.

Papers for presentation are scheduled as follows: "Polyphase Electric Testing Methods," by Professor H. J. Ryan; "Symbolic Representation of General Alternating Waves and of Double-frequency Vector Products," by Charles P. Steinmetz; "Note on the Progress of the Closed-globe Arc Lamp," by Louis B. Marks; "The Cost of Operation of Some Building Plants in New York City," by Percival R. Moses; "Constant-current Transformers," by Professor W. L. Robb; "Notes on Recent Developments in Single-phase Induction Motors," by Charles P. Steinmetz; "Elements of Design Favorable to Speed Regulation in Plants Driven by Water Power," by A. V. Garratt; "Protection of Alternating Secondary Circuits," by Dr. Cary T. Hutchinson; "Air Gap and Core Distribution" (part second), by Professor W. E. Goldsborough; "Electricity in Coal Mining," by Professor J. P. Jackson. Other papers suggested, but not definitely settled upon, may be presented by A. D. Adams, S. E. Doane, E. A. Sperry and Professor Laws.

Among the objects of engineering interest which are likely to be visited are the Cambridge pumping station, the South Boston electric-light station, the electric plant of the Union railway station, the Atlantic Avenue Edison station, the central power station of the Boston elevated railroad, the West End power station at Cambridge, and the new Boston fire-alarm station.

New York Electrical Society.

The annual meeting of the New York Electrical society for the election of officers took place at the electrical exhibition, Madison Square Garden, on Saturday evening, June 3d.

The following-named members were elected: Frank Gordon Rice, Charles B. McLeer, J. C. Forsyth, Edward A. Mahar, Jr., Ernest R. Bartlett, Charles M. Crowfoot, A. M. Young, J. Arthur Holly, Joseph M. Cooper and Henri W. B. Blomquist.

The report of the secretary showed that 135 members were elected during the year and that the total number of members on the books of the society was 704. The average standard of the meetings has been appreciably raised and the average attendance throughout the year has exceeded 200. The secretary does not recall any time when the society has stood so high in public estimation, has had a larger steady accession to membership and could point to a better record in a year's work than now.

The report of the treasurer is correspondingly good, as it showed that the society is in better financial shape than ever before. A detailed statement of the receipts and disbursements for the last year will shortly be mailed to each member of the society.

The election of officers resulted as follows: President, Gano S. Dunn; vice-presidents, Dr. C. A. Doremus, Frank A. Pattison, Charles Blizard, Arthur Williams, F. V. Henshaw and Stephen L. Coles; secretary, George H. Guy; treasurer, Henry A. Sinclair.

After the business meeting Mr. W. I. Clark lectured on the "Possibilities of Wireless Telegraphy."

American Electro-therapeutic Association.

The coming meeting of the American Electro-therapeutic association, to be held in Washington, D. C., September 19th, 20th and 21st, will be held at Willard's Hotel, corner of Fourteenth street and Pennsylvania avenue, N. W. For the use of exhibitors Willard's Hall has been secured. This hall immediately adjoins the hotel, and may be entered either from the hotel or from F street. The dimensions are 40 by 50 feet, and it is proposed to subdivide the floor space by three aisles, leaving exhibition spaces six feet deep by such length as individual exhibitors may desire. All possible arrangements have been made for the convenience of exhibitors, including either direct or alternating current. A charge for space will be made. Clifton Mayfield, M. D., 1335 Thirtieth street, N. W., Washington, D. C., is the chairman of the committee on exhibits.

Specification for a Professor.

It is rather an odd conceit to set forth in the form of specifications the qualifications that are desired in applicants for a vacancy in a college faculty. The Railway Age gives an instance, however, in the letter reprinted below. But it is probably a fair assumption that the writer had some certain individual in mind when he indited the half-playful epistle to his friend.

University of Illinois,
Urbana, Ill., May 18, 1899.

Prof. R. A. Smart, Lafayette, Ind.
Dear Sir: I inclose you the following specifications for an assistant in my department. If you know of a person suitable for the place I should be pleased to have you advise him of the vacancy.

Specification B: For an assistant professor in railway mechanical engineering at the University of Illinois.

Applicant must be a graduate from a leading technical school of the United States.

The following preferences are indicated: Age 35 to 40; American; height, 5 feet to 6 inches; weight, 150 pounds; two years' teaching experience, railway experience in shop, draft ing-room or testing department of importance, Application, stating experience, should be made in the handwriting of the applicant to L. P. Breckenridge, professor of mechanical engineering, Urbana, Ill.

Information: Salary, \$1,650. University is located at Urbana and Champaign, Ill., 120 miles south of Chicago on the Illinois Central railroad. Attendance for 1898-1899, 1,821. The work will be largely experimental. Locomotive road tests and dynamometer car experiments.

L. P. BRECKENRIDGE,
Professor of Mechanical Engineering.

The Water-power Failure in Austin.

On the Pacific Coast and in other localities it has happened that costly electrical power-transmission plants have been rendered useless for considerable periods of time by the lack of water, owing to periods of unusual drouth. Lack of initial power is a very serious thing to power-distributing companies, which are held responsible by their customers, and rightly so, for the original surveys and calculations of the watershed should be so thorough and conservative that the margin of safety will allow of operation in any conceivable low-water emergency. If this is not done, the power company must either maintain a steam plant of full-load capacity, to be idle 10 months in the year, and to be operated, usually, only with expensive fuel when used, or else shut down entirely and suffer great loss of prestige and revenue. It is well that these few failures in the continuous operation of water-power plants should be widely known, so that builders of later installations may profit by the experience. With this view the subjoined account of the failure of power supply at Austin, Texas, is reproduced from the Southern Industrial and Lumber Review. It will be observed that it is written from the point of view of an ardent well-wisher of the Austin plant; yet the lesson is none the less obvious:

"The facts concerning the shut-down are simply as follows: The Colorado River watershed has practically been without rains which drain to streams for nearly eight months. This is one of the most extraordinary periods of drouth on record, and the same may never be repeated and certainly will not be, in the ordinary course of events, for years. The construction of the great dam was perhaps faulty in the placing of the penstocks so high that the turbines cease to operate when the water falls eight feet below the crest of a dam 60 feet high. It has been demonstrated that at the time of the shut-down, after the severe drouth referred to, one or two feet more of water would have carried the plant over the period of practical stoppage, one month, and therefore had the penstocks been four or five feet lower, a still longer period of drouth could have been met without interruption.

"During all the period of anxiety and chagrin caused by the misfortune, there was a vast reservoir of water, of a depth of nearly 50 feet, at the dam proper, and running back for 30 miles—water enough to run the plant for a year without another drop of rain falling.

"This was the condition which led the people with great unanimity to demand a shut-down to enable the water to rise. It was a fine example of municipal unselfishness. People went back to lamps and candles, others to gas, and very many to the old electric-light company. They were willing to see their street cars drawn by mules and steam again; they were willing to patch up old steam boilers to run their printing-presses and other machines requiring power. There was no complaint. There was never any shut-down of the water-pumping plant, and the supply was never materially curtailed. The people watched with joy the rise of the water on the gauge at the dam, inch by inch, and finally when the floods came and the roar of the cataract over the crest could be heard for miles there was great rejoicing on all sides.

"The city has met this crisis in the history of the great plant with fortitude, and has thus given another proof of its faith in the enterprise. It will in the future authorize an expenditure to provide an auxiliary steam plant to guard against a shut-down in the future. It is said also that the placing of 'flash boards' on the crest is in contemplation by the Water and Light Commission. These precautions will surely prevent a repetition of the annoyance of this year."

Lightning Struck Twice in the Same Place.

A fierce thunderstorm passed over Manhasset, L. I., on June 1st, in which Christ Church was struck by lightning and considerably damaged. This is the second time within three years, says the New York Tribune, that this church has suffered from lightning. The most remarkable circumstance is that the course of the electricity this time was largely an exact counterpart of that taken by it before. The same one of eight wooden pillars supporting the church porch was shattered as before. From this point the current jumped both times in a horizontal direction to the east side of the church, tore off a line of clapboards till it reached a window, up which it moved about 15 feet, when again it moved horizontally to a metal gutter at the tran-

sept, from which it passed to a globe molding above the channel on the inside and from the molding descended by another window to the channel, tearing off one plaster as it found exit to the earth. The same course was followed and repeated except that the current then also followed horizontally to the west side of the church, as well as to the east side.

Electrical Power Applications in a Stove Foundry.

In a paper recently read before the American Foundrymen's association W. J. Keep of Detroit described some of the methods for handling materials in use at the works of the Michigan Stove company. A prominent feature of the apparatus is an open-air overhead traveling crane operated by electric motors. This crane reaches every part of the yard. It is an ordinary bridge, without a floor, provided with lateral trusses to allow the cab which contains the hoisting machinery to run on the lower chords. The bottom of the cab is of plate-glass, enabling the operator to see everything in the yard beneath him. In the cab are three controllers for operating the crane. The motor for moving the bridge is located at one end and the torsion of the shaft allows the other end to lag a little behind. When the crane can be spared the motor will be moved to the center, so that the travel of both ends may be the same. The length of the crane is 60 feet from one track to the other. Its capacity is three tons; the length of wheel base is 14 feet; the speed of hoist is 50 feet per minute, of cab 100 feet, and of bridge 130 feet. The motor for hoisting is six horse power, that for moving the cab 12 horse power, and for moving the bridge 12 horse power. The trestles for the bridge are pine; these on the foundry end are a part of the frame of the foundry, and on the other side form the frame of the flask house.

Another improvement is the use of an electric winch for moving steam cars on the main railroad track. At the farther end of the track is a sheave around which runs a five-eighths-inch steel-wire cable, each end of which is wound around one of the drums of the winch. One of the drums runs at twice the speed of the other, and one drum is free to unwind as the other winds the cable. At one point in the cable there is a link into which is hooked the end of a chain, the other end of which is attached to a car. An electric signal tells which rope to wind and when to stop. The motor of the winch is eight horse power and will move on the straight track several cars. It takes one man at the coupling and one man at the winch to move a car or to make up a train. This winch will be used at a future time to run some kind of coal conveyor to a receiving bin over the boilers, which are already fitted with Murohy smokeless furnaces, which have hoppers for self-feeding from this storage bin, but thus far, says Mr. Keep, no satisfactory conveyor has been found. There is an electrical generating plant on the premises, and all parts of the works are lighted, saving over \$50 each month during a good part of the year in gas bills. Mr. Keep concludes: "For various reasons we have not saved half the labor that we anticipated, and we expect to do much better in time. As it is, the saving is such that after setting aside \$1,000 each year for interest on the investment, we shall pay for the whole investment in three years with the present saving."

TRIFLING TECHNICALITIES.

"My horse has reasoning powers, I tell you."
"I wish what respect particularly?"
"Well, instead of shying at that automobile cab he edged up to it and kicked it."—Chicago Record.

Watts—"I see Tesla now claims he can telegraph clear around the world without wires."

Potts—"Clear around the world? I should think it would be cheaper to just telegraph across the room."—Washington Star.

"How do you explain the phenomena upon which you base your new discovery?" asked the inquisitive friend.

"Why, I adopt the usual method. I use words so big as to prevent anybody who is not in the same business from undertaking to contradict me. And then if anybody objects I can say it is professional jealousy."—Washington Star.

If the veracity of the New York Sun is to be relied upon, a new "hold-up" method has been practiced in the wicked metropolis of the East. Mr. Goroditzki of Philadelphia was the alleged victim. The story is that he was walking in Grand street, when he saw a man with an electric machine peddling shocks to children at a penny a shock. The little ones laughed so much that he fished out a penny and said he'd try the machine himself. "He bulls out der handle a lidle way," said Goroditzki, as reported in the Sun, "und I veels somedings dickle mine handt. Den he bulls out der handle away out, und bode off mine handts so up in der air und I gan't get 'em down. Vile hellless art I a loafer runs up und he dakes mine vatch and schain. I stamb und rache und schwear, but der feller mit der machine keebs mine handts in der air until der dief iss gone, ven he bushes der handle in und runs away mit der machine."

DEVELOPMENT OF THE TELEPHONE FIELD.

Stories of the Telephone.

[From the New York Tribune.]

The different ends of a connected telephone often present strange contrasts. At a large dinner at a Fifth avenue palace the other day the hostess waited for one of her guests, a woman who was known to be somewhat absent-minded.

"I should not wonder in the least if she has forgotten all about my dinner," said the former, and forthwith the telephone was brought into requisition. "I want Mrs. S!" called the impatient hostess to the servant who answered the call.

His mistress, in dishabille, was comfortably seated, reading an interesting book. She went to the telephone immediately.

"We are waiting dinner for you, Amelia," said the magnificently gowned woman at one end.

"Good gracious, Margaret, is this the date I was to have dined with you?" exclaimed Amelia, who was in a dressing gown and slippers, at the other end. "I am simply overwhelmed with mortification, but I entirely forgot that this was the night."

"Jump into a cab and come as you are," urged the first speaker.

"You wouldn't ask me to if you could see me!" laughed the other.

This contrast between the two situations suggested a topic of conversation after the guests were seated.

"I had rather an amusing experience in the way of a dissimilarity of situations between two speakers at either end of the telephone," remarked one of the guests. "Like everyone else at Tuxedo, when the telephone first came into vogue we used it continually as a method of conversation with our friends, and for convenience it was placed in my husband's dressing-room. One night, after I had gone to bed, the bell suddenly rang out with a persistence that would not be ignored. I hastily sprang from my bed in the dark, and started for the phone at a good pace, when suddenly I plunged headlong into Jack's bathtub, which was half full of water. Still the thing kept on ringing, and, fearing it might wake the baby, who was in the next room, I hurried, wet, cold and bedraggled, to the instrument.

"Hello! I cried, angrily. 'Is that you, Polly?' called out a gay voice, which I recognized as belonging to one of my friends. 'I am stopping here at the club. How are you, dear? We are just through dinner. A large party of us came down from New York. Charlie S— is here at the phone and wants to speak to you.' Then I heard laughter and chaffing, and I could fancy them all in the gay clubroom in their smart dresses. In a minute Mr. S— spoke. 'How do you do, Mrs. A—,' he began, and for fully 10 minutes I had to carry on a light conversation, first with one and then with another of the party, while I stood shivering in the dark in my damp and scanty garments."

"That was really a contrast," said one of her audience. "A thing that always seems so strange to me about a telephone is how a voice can be carried a great distance in a storm. Last winter I was stopping at a country house on an island near Stamford. It was blowing a furious gale of sleet and snow. The water was dashing madly against the rocks and the great trees about the house were swaying in the blast. All nature seemed to be in the wildest commotion, but the wires held fast, and when I rang up a friend in New York and his quiet voice came to me all the way through the wild night without a change in its tone it did seem almost marvelous."

A business house of Aberdeen, Scotland, recently engaged as office boy a raw country youth. It was part of his duties to attend to the telephone in his master's absence. When first called upon to answer the bell, in reply to the usual query, "Are you there?" he nodded assent. Again the question came, and still again, and each time the boy gave an answering nod. When the question came for the fourth time, however, the boy, losing his temper, roared through the telephone:

"Man, a' ye blin'? I've been noddin' me heid aff for t' last hauf 'oor!"

Wisconsin Telephone Company.

Stockholders of the Wisconsin Telephone company will hold a special meeting June 19th for the purpose of increasing the capital stock from \$1,200,000 to \$3,000,000. It is intended to use the new capital in extending the long-distance lines to many points in the state not now reached, in the erection of new exchange buildings and in making other improvements. An energetic canvass for new business is also being made, and the company will endeavor to increase the number of its subscribers to 25,000. Only copper lines will be built in extending the service. The principal improvements will be made in Milwaukee, but other cities will also be benefited. La Crosse has received word that \$25,000 to \$30,000 will be expended there in improvements.

San Jacinto, Cal., will soon have a telephone exchange system.

Telephone Ordinance Vetoed.

Mayor Hoos of Jersey City has vetoed an ordinance granting a franchise to the Hudson Telephone company to extend its lines through certain streets in the city. The company is endeavoring to gain a foothold in the city in order to compete with the New York and New Jersey Telephone company, but is having some difficulty. An ordinance passed by the Board of Street and Water Commissioners several weeks ago, granting a franchise, was vetoed by the mayor on the ground that the company should be required to give the city some compensation for the franchise. The board sustained the veto and adopted a new ordinance which required the company to pay two per cent. of the dividends. That was the company's suggestion. Mayor Hoos insists that this is not sufficient compensation, and, besides, is too indefinite, as the company might never declare any dividends. He suggests that the company should be required to pay \$1,000 cash and one per cent. of its gross earnings for the first four years, two per cent. the next four, three per cent. the next four, four per cent. the next and five per cent. the next, remaining thereafter at that figure.

Bell Instrument Output.

It is a matter of common knowledge that the present demand for Bell instruments is larger than ever before in the history of the corporation. This is due partly to the extension of the company's lines and the increase in existing exchanges, and largely to the competition of independent exchanges, which has made it necessary for the Bell interests to replace their old apparatus with modern equipment to meet the improved service of the newcomers. The gross output of instruments for the month ended May 20th amounted to 55,302, whereas the orders for instruments amounted to 62,000. The following table gives the net output of instruments by months for the last four years, showing clearly the rise in general business prosperity:

	1899.	1898.	1897.	1896.
January.....	31,829	15,820	8,036	10,052
February.....	35,787	13,107	11,665	10,857
March.....	53,503	13,172	12,697	11,952
April.....	48,402	16,125	13,181	15,195
May.....	34,937	20,493	12,146	12,464
June.....	.....	14,321	9,588	10,937
July.....	.....	11,540	8,618	2,994
August.....	.....	12,841	5,613	1,825
September.....	.....	19,046	12,093	5,012
October.....	.....	21,816	15,986	7,514
November.....	.....	19,673	21,206	6,112
December.....	.....	27,771	17,575	3,839

Danger in Telephoning Society Leaders.

A man who said his name was Robert Smith entered the long-distance telephone office in Syracuse the other day and announced that he wanted to talk with Mrs. Cornelius Vanderbilt, Jr., and with Mrs. Levi P. Morton and her daughters. When told that they could not be communicated with in that manner, he said impatiently: "Why, they are well known in New York and anyone can tell who they are. I am on terms of familiarity with all of New York's '400,' and frequently call them up on the telephone. I have talked with them on the telephone a dozen times within the last few weeks." The young woman in charge of the telephone called in Detectives Dorner and Wood, and they locked Smith up at headquarters. Smith is thought to be demented.

MANUFACTURERS AND DEALERS.

C. W. Farr, president of the Farr Telephone and Construction Supply company of Chicago, informed a representative of the Western Electrician that the business of the Farr company during the last four months was about double that for the same months in 1898. This is certainly an excellent showing, and speaks well for the energy of the Farr company's officers and its products.

During the last week the Western Telephone Construction company has been busy placing a lot of new machinery in its factory at 250 South Clinton street, Chicago. The addition is practically a duplicate of the present equipment, thus giving the company double the capacity heretofore enjoyed. The company reports an extraordinary order business and most flattering letters with reference to the recent improvements in its telephone apparatus.

EXTENSIONS AND IMPROVEMENTS.

The board of management of the National Telephone company has decided to construct a line from Fort Wayne to Decatur.

The Rocky Mountain Bell Telephone company intends to begin the construction at once of a line through Idaho from Webster to Buffalo Hump via the Seven Devils.

The Bell Telephone company is establishing a number of pay stations in Montreal on the nickel-in-the-slot principle. The instruments will be placed in drug stores, but the system will be distinct from the ordinary telephone in the store. The person who may desire to use the instrument will call up central, but connection will not be made until a five-cent piece has first been deposited in the slot.

Telephone News from the Northwest.

[From the Minneapolis correspondent of the Western Electrician.]

The Northwestern Telephone Exchange company has added a 50-drop switchboard to its exchange in St. Cloud, Minn. The system has 175 connections now, and is expected to reach 200 shortly.

Supplies are arriving for the Zenith Telephone company's new exchange for Duluth, Minn., and work will soon be begun.

The Chinook-Cleveland Telephone company has awarded contracts for the construction of a telephone line from Chinook, Mont., to Cleveland.

The Mutual Telephone company of Des Moines, Ia., will establish a sub-exchange at East Des Moines and one at Valley Junction, a suburb of Des Moines.

Had the city of Minneapolis appealed from the decision of the court with reference to the Northwestern Telephone Exchange company's right to set poles on Lake street, because that street was a postroad, it would have won the case. The point at issue was the same as has recently been decided in the Supreme Court of the United States.

The Germania (Ia.) Telephone company is building a toll line from Algona, Ia., to Belmond.

The Ogden Telephone company is constructing a telephone exchange in Ogden, Ia.

A telephone line will be built between Hampton, Ia., and Belmond, by a Mason City company.

The Mississippi Valley Telephone company outwitted J. B. Gilfillan in Minneapolis, despite his almost sleepless vigilance. He objected to a pole being placed in front of his property, and an officer was on guard day and night to keep the company from putting it there anyway. But there was a hiatus of 30 minutes between the time of the night man's relief and the arrival at the disputed point of the day man. The night before the pole was set the council gave the company permission to set the pole, and the next morning, between 3:30 and 4 a. m., the pole was set. The ex-congressman soon discovered the work was done, and he gathered a few objectors and proposed to cut the pole down. The policeman on the beat telephoned for help, and the matter was referred to the city attorney, who held the telephone company had the right to keep the pole there, after the council's action.

The Fairmont (Minn.) Telephone company has begun constructing a toll line from Wilbert to Armstrong, and will start work soon on a line to Madelia.

The Duluth (Minn.) Telephone company announces that all patrons will receive a rebate for the full amount of rental for the period service was interrupted by the fire in the central office.

The Nevada Mutual Telephone company has purchased materials for its new exchange to be installed at Nevada, Ia.

The Billings and Musselshell Telephone company of Billings, Mont., has erected poles for a new toll line, and will string wires as rapidly as possible.

The Winona (Minn.) Telephone company has placed an order for a new switchboard of 1,200 drops.

A riot was almost precipitated in Beloit, Wis., by the attempt of the Wisconsin Telephone company to plant a pole in front of E. Fluekiger's residence. The latter placed a chair over the hole and sat there most of the afternoon, and the workmen were driven away by citizens. The mayor then suspended further operations by the company.

The Northwestern Telephone Exchange company is offering special inducements to people of Fargo, N. D., to take telephone service.

Hawarden, Ia., will vote, June 12th, on granting a telephone franchise to the Hawarden Telephone exchange.

The Washington (Ia.) Telephone company is building a toll line to Wellman, Ia.

Charles Blumenstein of Wellman, Ia., contemplates a telephone line to a creamery eight miles north of Wellman.

Bruening Bros. have ordered materials for the construction of the new telephone system at Ackley, Iowa.

W. B. Sirom has been granted a franchise for a telephone exchange at Hector, Minn.

The Northwestern Telephone Exchange company will begin work at once rebuilding the exchange at Grand Forks, N. D.

T. A. Potter of the Western Electric company of Britt, Ia., is to be made general manager. B. C. Way will succeed him as secretary. This company is pushing toll-line construction in South Dakota. A line is being built to Woonsocket, and between Mitchell and Chamberlain. The Dakota Central Telephone company will connect with the system at Woonsocket, building from Huron for the purpose.

J. G. Lindsay, manager of the Mississippi Valley Telephone company at Muscatine, Ia., has been arrested on a charge of misappropriating \$245 of the company's money.

The Home Telephone company of Sioux City, Ia., has made connections with the Sheldon, Rock Rapids, Cherokee and Spirit Lake independent systems, including 300 miles of toll lines with 40 towns.

Work will be started on the new telephone exchange at Fonda, Ia., as soon as the materials arrive.

The Northwestern Telephone Exchange company has found its business increasing so much in Min-

neapolis that a new contract office has been opened at 430 Nicollet avenue, with toll instruments.

The Standard Telephone company has just installed an exchange at Mabel, Minn.

The Cedar Valley Telephone company has just been granted a franchise at Iowa Falls, Ia. The Iowa Telephone company already has an exchange there, and at once arranged to give Sunday and all-night service, and is otherwise preparing for a fight.

let the contract to construct its line from Pine City, Minn., to Sandstone.

It is reported at Ottumwa, Ia., that the old telephone company is making contracts at 75 and even 50 cents a month.

The Perry Telephone company of Perry, Ia., has changed its name to the Hawkeye Telephone company.

The Iowa Telephone company announces that a

Single-Phase Distribution.

[Continued from page 27]

terminal. It is, therefore, a fair average pressure chart. I am confident that no two-phase or three-phase stations can show charts equal to this, nor can it readily be beaten in direct-current work.

In my paper read before the association last year I gave the calculated efficiency for the system, assuming each feeder to be operated at its rated capacity. I am now able to give these efficiencies as obtained by a direct measurement on the system in actual operation.

Fig. 6 shows an efficiency curve for all loads plotted from actual tests. The losses in detail at four of the several loads from which the efficiency curves were plotted and given in following table:

LOSSES AND EFFICIENCY OF UNDERGROUND SYSTEM OF DISTRIBUTION.

Load at station	in kilowatt	100	150	200	1120
Feeder loss		0.4	0.6	0.8	1.6
Transformer iron loss		0.5	0.5	0.5	0.5
Booster iron loss		0.5	0.5	0.5	0.5
Transformer copper loss		0.5	0.5	0.5	2.5
Booster copper loss		0.5	0.5	0.5	0.5
Secondary mains and house wiring		0.5	0.5	0.5	4.6
Total losses in kilowatt		1.23	2.6	2.0	11.7
Energy delivered		37.7	405.4	370.0	1368
Efficiency		75.7	91	72.6	90

The efficiency at 100 kilowatts is the minimum efficiency. The efficiency at 430 kilowatts is the maximum efficiency.

The station load of 950 kilowatts was the average daily load at the time these tests were made, the maximum station load being 2,000 kilowatts. The average load for the year, based on the same maximum, would be considerably less than 950, and would, therefore, more nearly approach the maximum efficiency of over 94 per cent. In these tabulated losses are included the losses in the feeder regulators or boosters. These, being a part of the station apparatus, are usually excluded in calculations of distribution efficiency. If we excluded them in this case, we would increase the efficiency shown from one-half to one per cent., according to the load. In looking over this table, one is struck at once with the remarkably small transformer iron loss. That the transformers were most carefully designed to keep down to the lowest possible amount this constant loss has been mentioned before. To make the effect of this clear in a more striking way, we will consider the result of cutting out one feeder completely on the average load of 950 kilowatts. This is a favorite suggestion for decreasing the losses with light loads in alternating-current distribution. There being 30 transformers in service, by cutting one out we would decrease the transformer iron

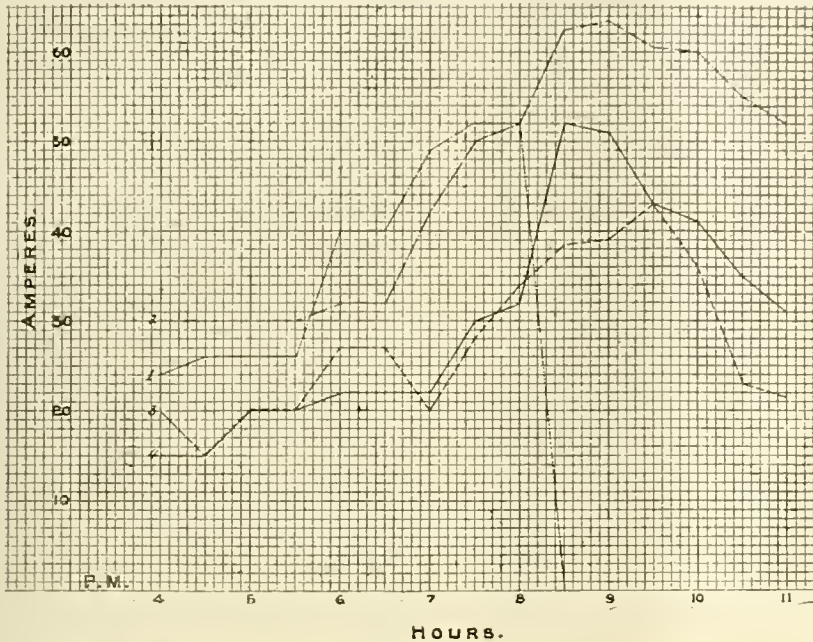


FIG. 4. SINGLE PHASE DISTRIBUTION.—CHANGE OF FEEDER LOAD BY DROPPING POTENTIAL 1 1/2 PER CENT AT FEEDER END.

The Cedar Valley company announces that it is quite ready for a fight also.

The People's Telephone company of Chatfield, Minn., inaugurated a 24-hour service June 1st.

The Northwestern Telephone Exchange company is pushing work on the new line to give a more direct connection between the Twin Cities and Fargo, N. D., and will soon have it completed. The company finds the telegraph, used in connection with the telephone, is a great saving of time. A station can be called by wire, and the person wanted sent for, without waiting for the wire to be clear to that point, as was the case when the telephone only was used.

The residents of Corvuso, Greenleaf, Cedar Mills and Acoma are anxious to get telephone connection with Hutchinson, Minn.

The Lime Springs and Bristol Telephone company has been formed at Lime Springs, Ia., with \$1,000 capital stock.

The Le Sueur Telephone company has been incorporated at Le Sueur, Minn.

The Janesville Telephone company has over 400 connections made for the new exchange at Janesville, Wis. A similar exchange is about to be put in at Beloit, Wis.

W. J. Bonwell of St. Paul contemplates putting in a telephone exchange at Hibbing, Minn.

The Minnesota Mutual Telephone company will soon extend its wires west through Herman, Minn.

The Nevada Mutual Telephone company has been granted a franchise, by popular vote, at Nevada, Ia.

The telephone company will work from Harvey, N. D., west to Anamoose, N. D., at once, and will build an extension from Cathay, N. D., to New Rockford and Carrington.

R. H. Larrabee and T. Pagenkopf propose to form a local telephone exchange at Sleepy Eye, Minn.

The New Ulm (Minn.) Telephone company has sold its toll lines to the Western Electric Telephone company.

The Commercial Telephone company is building a line between Montour and Le Grand, and also between Montour and Tama.

Cloid H. Smith has received supplies at Odebolt, Ia., for his new exchange. He is preparing to build a line to Beloit and one to Schleswig.

The Little Wolf River Telephone company will extend its line from Fond du Lac, Wis., to Ripon, Waupun and other points.

W. T. Sparks, an applicant for a telephone franchise at Waunakee, Wis., is unwilling to accept the franchise tendered.

The Wolf River Telephone company is an applicant for a franchise at Watertown, Wis.

The council of St. Paul has finally passed an ordinance acceptable to the American Telephone and Telegraph company for a long-distance telephone franchise, and the mayor has signed it. It provides for connection within 90 days.

The Oshkosh (Wis.) Northwestern Telephone company has received the new 600-drop switchboard for its new exchange, which is now about ready for occupancy.

A local exchange is talked of for Brodhead, Wis., H. L. Wortham being the promoter.

The Minnesota Mutual Telephone company has

toll line will be constructed from Dubuque, Ia., to Waukon, Lansing and New Albin, Ia.

The Germania Telephone company of Germania, Ia., is building a local system, and will connect with the surrounding towns.

The telephone exchange at Oelwein, Ia., has been removed to new quarters, and a new switchboard of 100 drops put in.

E. E. Smith, manager of the telephone exchange at Owatonna, Minn., has gone to Hector, Minn., where he will install an exchange.

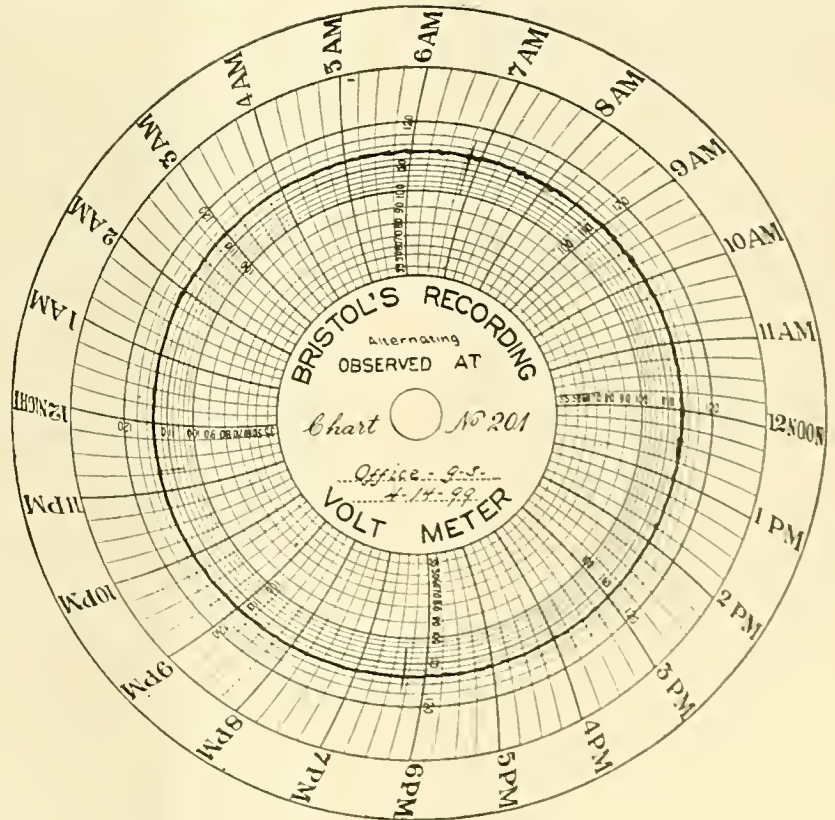


FIG. 5. SINGLE-PHASE DISTRIBUTION.

The Inland Telephone and Telegraph company has begun putting its wires in the business district of Spokane, Wash., underground. It will take about eight months to complete the work, and the expense is estimated at \$140,000 to \$150,000.

The Wisconsin Telephone company proposes to extend two long-distance lines to West Superior, Wis., one from Ashland and one from Abbotsford, Wis.

loss one-thirtieth, or one-fourth of a kilowatt. We would, however, increase our feeder loss, by the addition of one-thirtieth of the current to each feeder, in the ratio of 30 squared to 3 squared. This would increase the feeder loss about seven per cent., or slightly over two kilowatts. The copper loss in the other transformers would be increased in the same proportion, or to the extent of a little less than three-fourths of a kilowatt. The actual result, then, of

cutting out one feeder and its transformer would be to decrease the transformer loss one-fourth of a kilowatt, and increase other losses to the extent of $2\frac{1}{4}$ kilowatts; or, in other words, we would actually increase our total losses in this case by $2\frac{1}{2}$ kilowatts.

Fig. 7 shows efficiency and power-factor curves of a 10 horse power single-phase motor. It has also been thoroughly demonstrated that single-phase alternating-current motors can be built for variable-speed work, and there are already many

rent motor, in such a way as to give a constant torque at all speeds. The efficiency of this motor at full speed is the same as that shown in Fig. 7. A number of installations have been made in St. Louis of motor-generator sets for transforming single-phase alternating-current energy into direct current for uses to which direct current only is applicable. These outfits consist of induction motors, directly connected to direct-current generators. So far, there has not been a single demand for current or energy for any purpose for which electric current has ever been used, which we have not been able to supply efficiently from our single-phase alternating-current mains. This experience, and the knowledge that current is required for as many different purposes in the city of St. Louis as in any other existing city, lead me to state positively that single-phase currents can be used for general distribution to supply all requirements. As I have stated before, each class of current, single-phase, two-phase or three-phase, has a field of its own; and the field in which single-phase current reigns supreme is that of general distribution.

Having been assigned the title of this paper, it has been impossible for me to avoid repeating much that I said last year, and I have been afraid from the first of appearing to rehearse an old story. It gives me some satisfaction, however, to be able to make statements based on the actual operation, for over a year, of a system embodying a special form of single-phase distribution, for which, a year ago, I made many claims that were looked upon by many as hypothetical. All that has been presented for this system has been fully achieved in its operation.

Electricity on New Cruisers.

The six fine cruisers—Denver, Des Moines, Chattanooga, Galveston, Tacoma and Cleveland—authorized by Congress last March will show an increased use of electric power for auxiliary machinery. The blowers for ventilation and forced draught, the ammunition hoists, winches and anchor hoists will be operated by electricity, the only auxiliary steam engines being for the ice machines, steering gear, dynamos, distilling plant and machine shop. The main engines will be of the vertical triple-expansion type in separate water-tight compartments, developing 4,500 horse power. They will get steam from six water-tube boilers aggregating 4,700 horse power and installed in two air-tight compartments. The weight of the machinery is limited to 405 tons; 22 tons of engines will be carried, and there will be 40 tons of reserve feed-water. The cruisers will have two smokestacks, with their tops 70 feet above the grates. Steam heat will be fitted throughout the hull. For electric light and power there will be four generating units, weighing not over 35 tons. These cruisers will have a displacement of about 3,200 tons each and a speed of about 16½ knots

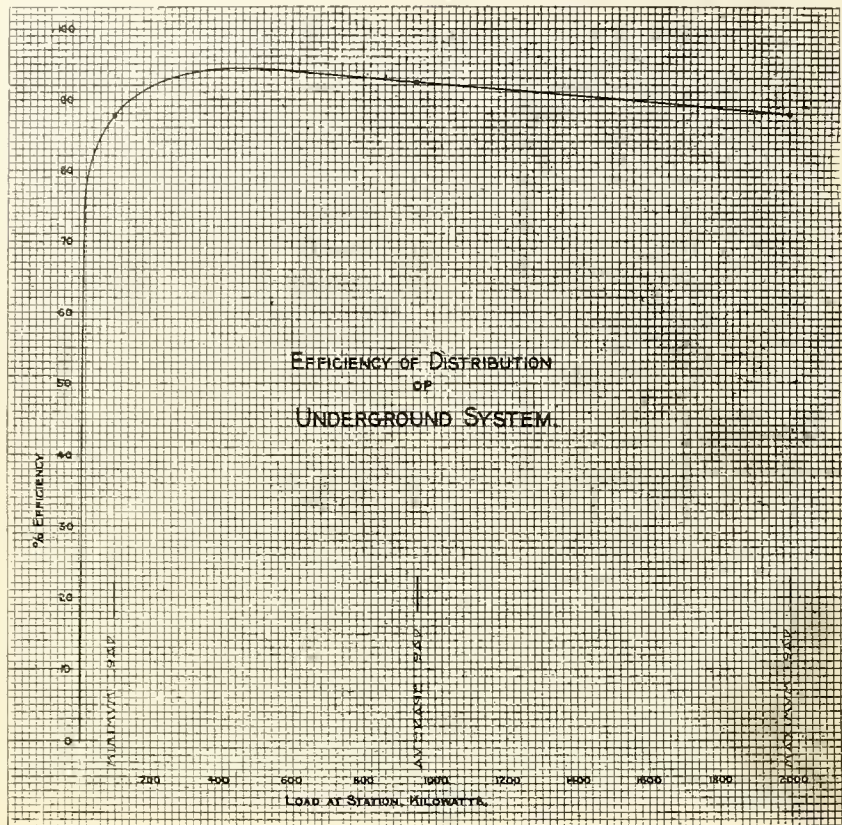


FIG. 6 SINGLE-PHASE DISTRIBUTION.

It is hardly necessary to state that, with this system, we never cut out feeders, if we can avoid it.

The ratio of current delivered to customers, as shown by customers' meters, to the actual station output, as shown by the station wattmeters, while not an exact measure of the distribution efficiency, owing to the losses in the customers' meters and their failure to record properly at small loads, is, nevertheless, a good indication for relative comparison. On the single-phase underground-distribution system described, this ratio of customers' meter readings to station output reaches 86 2-10 per cent. The meters used on customers' premises are the most recent type of induction wattmeters. The station meters are of the Thomson recording type, and these are carefully checked by the half-hourly records of station indicating wattmeters, both being frequently calibrated. While this figure may be the highest on record, it has been obtained with such great care, month after month, that I feel great confidence in its accuracy. The greater portion of the overhead distribution of this same company is of the usual form, with individual transformers to each customer, as already stated. A large portion of the current supplied in this way is used in residences, and, consequently, the load factor is very low. The meters used in this work are recording amperemeters, which let a considerable amount of current slip by unrecorded with light loads. The transformers are all of modern design and of high efficiency for their size. I may surprise you, however, when I state that the ratio of customers' meter readings to station output in this overhead distribution is only 48 3-10 per cent. I am also as positive of the accuracy of this low figure as of that of the remarkably high one for the underground system.

The only strong argument that has ever been made against single-phase distribution is the contention that the single-phase current is not suitable for operating motors. I admit that, until quite recently, it has not been shown positively that motors could be operated by single-phase current as efficiently and with as great reliability as by two or three-phase currents. For over two years, however, we have been operating single-phase motors in St. Louis with the greatest success, and we now have about 1,000 horse power in such motors connected to our lines. As stated before, these motors vary in size from one-half to 25 horse power. The efficiency is as high as that of direct-current motors, or two or three-phase motors, and in construction they are fully as simple and free from complication. The type used for constant speed work is started and stopped by a single switch, placed in any convenient location, and without the use of rheostat or controller. A commutator is used to secure the required torque at starting and to bring the motor up to speed, after which it is entirely disconnected.

Our experience has shown that the cost of maintenance on these motors is very much less than that of direct-current motors, and as low as that of two or three-phase motors.

such motors in use where full torque is required at varying speeds, such as driving direct-connected elevators and operating ventilating fans. These motors are operated without commutator, but require a controlling device for varying the speed. In Fig.

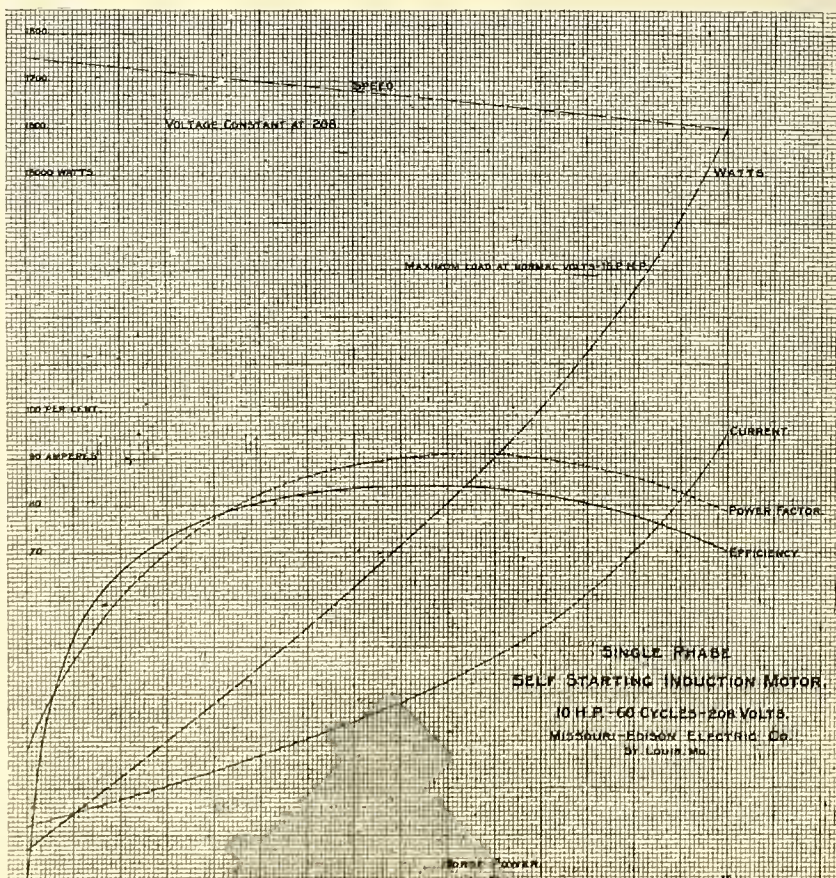


FIG. 7. SINGLE-PHASE DISTRIBUTION.

8 are shown torque and current curves of a single-phase variable-speed motor. These torque curves, taken at different positions of the controller, show that full-load torque can be obtained at any speed from zero to full speed; in fact, the motor can be controlled with as much ease as a series direct-cur-

rent motor. The steel hulls will be sheathed with wood and copper below the water line, giving comparative independence of dry-docks. As modern cruisers go, they will not be fast, but they will be comfortable boats, with heavy armament of five-inch rapid-firing rifles and a wide cruising radius.

New Ward Leonard Rheostat.

A new rheostat for all continuous-duty purposes, such as motor-speed regulation, is illustrated herewith. This rheostat is believed to contain many new and important advantages, and it is extremely compact. A cast-iron plate has parallel ribs extending along the back; between these ribs there are long slot-like openings so that a grid-like construction is obtained. The entire back surface of the grid, including the walls on both sides of the ribs, is covered with porcelain enamel, and then a coil of wire is placed between the ribs and over the slot; this coil of wire is attached by enamel to both the side walls of the ribs between which it lies. The ribs extend up high enough to thoroughly protect the coil lying between them in the V-shaped space.

It will be seen that this construction gives excellent ventilation, while holding the coil at two points in each whorl of the coil. This attachment of the wire at intervals only leaves it free to expand without producing any breaking strain on the enamel which attaches it, and yet the attachment permits of a free conduction of heat to the entire surface of the cast-iron. Thus the result is obtained of having nearly perfect conditions for heat convection by air currents, together with the large heat absorptive capacity of the cast-iron and the large radiating surface obtained by the grid with the extended ribs.

This rheostat is the invention of Mr. H. Ward Leonard, and the the Ward Leonard Electric company of Bronxville, N. Y., is placing it on the market. The grid shown in the illustration is one of 40 sold to the South Side Elevated Railroad company at Chicago, and is 10 by 10 inches. It has 200 ohms resistance and will be used directly across 600 volts, so that it will carry three amperes continuously, and hence dissipates continuously 1,800 watts.

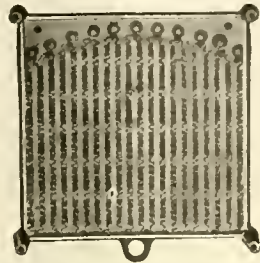
CORRESPONDENCE.

New York Notes.

New York, June 5.—The electrical show came to an end on Saturday night. It is said to show a good balance on the right side of the ledger, and the exhibitors express themselves as entirely satisfied with their end of the business. Congratulations were extended to President C. O. Baker, Jr., Vice-president H. L. Shippy, Secretary and Treasurer George F. Porter, J. W. Godfrey and to General Manager Marcus Nathan, who has kept the show well in hand, and carried out to the fullest extent every subject that could add to its popularity. The voting contest that has been going on at the show also closed on Saturday. The prize was an automobile for the most popular actress, and was won by Maude Adams, with 14,764 votes to her credit. The next in the list was Lillian Russell, who polled 13,615 votes. The other contestants re-

from his position as superintendent of the police telegraph system of Hoboken by Mayor Fagan of that city. Mr. Banta, as president of the new electric-light company, offered to supply the city of Hoboken with free electric lights for a year in return for a franchise allowing the new company the same privileges as are enjoyed by the North Hudson Light, Heat and Power company, which has a monopoly of the electric-light business in Hoboken. Mayor Fagan and a majority of the Common Council have taken a decidedly friendly stand toward the old company, which is controlled by the Shanley syndicate. It is generally believed in Hoboken, according to the New Jersey editor of the Tribune, that Mr. Banta's dismissal as superintendent of the police telegraph system is due to the Hoboken idea of "getting hunk." It is said that no fault whatever is found with his work.

Work is steadily progressing on the electrical



NEW WARD LEONARD RHEOSTAT.

equipment of the Brooklyn elevated railroad, and it is expected that the Fifth avenue division, as far as Thirty-sixth street, will be ready for electricity within two weeks. The stations, like the cars, are being wired for electric lights.

New York may have an automobile club, like Paris. Whitney Lyon, at the request of a number of owners of automobiles, has called a meeting at the Waldorf-Astoria for Wednesday evening, for the purpose of an informal discussion as to the feasibility of organizing such a club in this city. In the course of his statement Mr. Lyon says: "In view of the rapidly increasing number of those who own and operate self-propelled pleasure vehicles in this country and the general widespread interest in the subject, both here and abroad, and the almost certain use of the automobile as a form of sport in the United States, and the difficulty of procuring proper storage and care for the vehicles, it has been thought desirable to call this meeting of owners or intending owners of these vehicles for a conference looking toward the formation of a club which, in due time, shall have a clubhouse where the carriages may be properly stored and cared for by competent mechan-

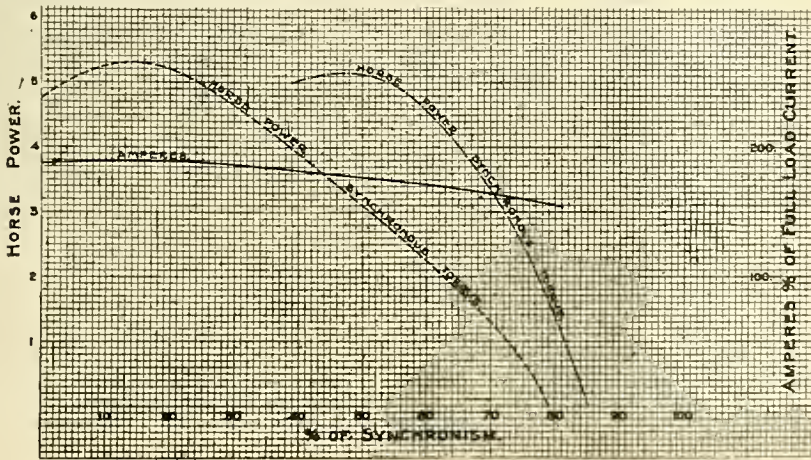


FIG. 8. SINGLE-PHASE DISTRIBUTION.—TORQUE AND CURRENT CURVE OF FIVE HORSE POWER SINGLE-PHASE VARIABLE SPEED MOTORS.

ceived the following votes: Mrs. Leslie Carter, 8,994; Viola Allen, 5,640; May Irwin, 4,129; Edna May, 3,974, and Julia Marlowe, 1,565.

The electrical soap-barrel "joke" that I mentioned last week was investigated by the coroner of Paterson, and the jury decided that the death of Magill, the victim, was caused by his coming in contact with a live electric wire run through a barrel of soft-soap, and that the wire was placed there by Joseph Grant.

Bion L. Burrows was chosen secretary of the Rapid Transit Commission, succeeding L. L. DeLafield, on Thursday last. Mr. Burrows is a graduate of Cornell University and prepared for the law, but did not practice. He was for part of Mayor Strong's administration the mayor's private secretary. He was strongly recommended for the place as secretary of the Rapid Transit Commission by ex-Mayor Strong and General Anson G. McCook. The salary will be \$2,500.

Mr. A. K. Banta, president of the North River Light, Heat and Power company, has been deposed

PERSONAL.

H. K. Gilman, the president of the Western Electrical Supply company of St. Louis, called on his friends in Chicago early in the week.

E. M. Reed, of F. M. Reed & Co., contracting electrical engineer of Kansas City, was in Chicago during the week purchasing electrical goods.

The University of Colorado has just conferred the degree of LL. D. on Brigadier-General Irving Hale, who has so distinguished himself in the Philippines. General Hale is the well-known Denver electrical man.

Albert Pack, the millionaire promoter of Detroit's three-cent experiment in street-railway service, died last week from the effects of an operation for liver disease. Mr. Pack was born in 1842. The foundation of his fortune was made in pine lands.

M. M. Wood, well known in the electrical field as the inventor of Wood's railway specialties, and formerly with the Ohio Brass company of Mansfield and the Central Union Brass company of St. Louis, has been appointed manager of the railway department of the Central Electric company of Chicago.

Lieutenant-Colonel Robert Craig, United States Signal Corps, has been ordered to Manila to become press censor there and chief signal officer to General Otis. He will relieve Major Thompson, who has done such excellent work in maintaining the communication between General Otis and the troops in the field. Major Thompson will return to San Francisco.

Oscar Oliven, an electrical engineer in the employment of the Union Electrical company of Berlin, is in the United States. He will devote several weeks to studying the electric vehicles of this country, after which he will go to Buenos Ayres, where he will superintend the building of a large electrical plant and the establishment of a street-car system. Mr. Oliven was astonished at the number of automobiles he saw in New York. He thinks that in a year or two New York will have more of these vehicles than any of the European cities, and even now he regards the average American automobile as far superior to those of Paris. "Their speed may not be so great," he said, "but you are wise enough not to sacrifice all the other good points for speed. These cars combine comfort and safety, and beauty to a remarkable degree. In Paris they have a great many of the benzine motors, which are very bad-smelling, but I have seen none of them here." Mr. Oliven was very complimentary in referring to American electricians, saying that in Berlin and other European cities they are preferred to native-born men.

ELECTRIC LIGHTING.

The Electrical Installation company of Chicago has just closed contract for the complete rehabilitation of the Vicksburg (Miss.) electric-lighting system. Work will be started immediately and rushed to completion within 90 days.

The Waxahachie (Texas) Electric Light company is said to be the first electrical company in the South to use aluminum as an electrical conductor. It has placed an order for about 500 pounds of the metal in bare wire of large size.

The Terrace City Improvement and Construction company has been incorporated with a capital of \$100,000 to furnish electricity for lighting purposes in Yonkers, N. Y. The directors are Oren E. Wilson of Albany, David L. Gluck of New York and Fremont Wilson of Yonkers.

The new electric-light plant to be erected at Sixty-fourth street and Wentworth avenue, Chicago, for street illumination, is to be called the "Robert A. Waller station." Comptroller Waller was one of the most active advocates of an extension of lighting facilities on the South Side.

The War Department, through the United States Engineer's Office at Newport, R. I., is inviting sealed proposals, until June 24th, for furnishing and installing an electric-light and power plant in the gun emplacement at the Dumplings, Conanicut, R. I. Specifications and any information desired by prospective bidders will be furnished upon application to Major D. W. Lockwood, Newport, R. I.

A superb granite column, 40 feet high, is to be erected in the open space in front of the new South Union station in Boston, and it will have at the top a brilliant cluster of electric lamps, for the purpose of illuminating the square, which has been renamed Dewey Square. The pedestal is already in place and work is going forward rapidly. In proportions and beauty of material and construction the shaft promises to be one of the handsomest memorials in the city, and will fitly honor the great admiral. The polished base weighs 14 tons and the column entire will represent about 200 tons of massive granite and wrought iron.

The Treasury Department is inviting sealed proposals until June 20th for installing an electric-light and power plant in the United States custom house at Cincinnati, Ohio. Specifications and plans can be obtained upon application to H. A. Taylor, assistant secretary of the treasury, Washington, D. C., or to the custodian of the building

ics, and where may be found also a library of literature upon the development of the automobile, as well as suitable meeting rooms for social intercourse and general suitable change of views upon the subject. It is proposed to restrict the membership to owners of good social standing, and to strictly eliminate any trade interests, following the general lines which have been so successful in establishing the well-known organizations abroad."

There were sharp fluctuations in the copper market last week. The stock of the Amalgamated Copper company closed a week ago Saturday at 100 bid, 100¹/₂ asked. On Thursday it sold down as low as 85, for small lots, and closed at 88¹/₄ bid, 90 asked. On Friday, however, on support by "insiders," it is said, it made a noteworthy advance, sales being made as high as 95, and the final quotation being 94 bid, 95 asked. In Boston, too, where Boston and Montana dropped more than 40 points on Thursday, and the other copper stocks suffered correspondingly, a general rally occurred later, the stocks regaining a large part of their losses. M. S.

at Cincinnati. Request for plans and specifications must be accompanied by a certified check in the sum of \$10 as a guarantee that such plans and specifications will be returned to the department. The amount will be returned to the bidder on their receipt. Proposals from actual manufacturers only will receive consideration.

The Edison Electric company of South Bend has been incorporated at South Bend, Ind., with \$100,000 capital. The incorporators are Otto M. Knoblock, George A. Baker, A. W. Morrell, George Wyman and Samuel S. Perley. The council will be asked for a franchise, and the company will proceed to put in a modern generating plant, using the three-wire system and 110-volt direct current for commercial lighting. The feeders and wires in the central part of the city will be run in conduits, and in every particular the plant will be a first-class one. Messrs. Knoblock and Morrell of the incorporators are connected with the Miller-Knoblock company, South Bend, Ind., manufacturer of electrical machinery.

ELECTRIC RAILWAYS.

The Broadway cable line in St. Louis is to be rebuilt for electrical operation.

The United Projects Syndicate of London has purchased the tramway system of Vera Cruz and will operate it by electricity.

The Big Rock Railroad company of Little Rock, Ark., is a new organization formed to build a railway line into the suburbs of the city.

It is reported that Albert L. Johnson, brother of Tom L. Johnson, and a well-known street-railway man, is in London endeavoring to secure the right to build and operate electric street-railway lines in that city.

The Indianapolis and Greenfield Rapid Transit company has been granted a franchise through Knightstown. This company proposes to build from Indianapolis east to New Castle. J. J. Cooper of Indianapolis is president.

Work has been begun on the new electric railway to run from Houston, Texas, to Oak Lawn, a suburb. J. B. Frost and others, who some time ago purchased the Magnolia Park railway, are the projectors of this enterprise.

It is stated that the syndicate that recently purchased the interests of the Consolidated Street Railway company at Dallas, Texas, is contemplating the substitution of the trolley system, for the operation of its 24 miles of line, for the animal power now in use.

More than one electric railway now building or projected is claimed to be "the longest in the world." The distinction is claimed for the line from Toledo to Dayton, O., which will be 153 miles long. It is said that work will be begun at once in both directions from Lima, O.

Peter Schwab of Hamilton, Ohio, heretofore a stockholder in the Cincinnati and Miami Valley Traction company, has secured a controlling interest in that company, it is said, in the interest of a syndicate which proposes to consolidate several of the electric-railroad companies in that vicinity.

A company is being formed at Fort Worth, Texas, with J. E. Martin at the head, for the purpose of constructing an electric street-railway line to traverse the eastern portion of the city, which is the most densely populated part of the town, but which at present has no street-car accommodations.

In order to save its charter rights the Martha's Vineyard (Mass.) Street Railway company had an old steam-railway baggage car dragged through the streets of that town by horse power the other day. The tracks for the electric cars have not been laid, owing to the fact that a location has not yet been agreed upon.

Angered by alleged abuse of a fellow-countryman, a number of Russian Jews recently attacked the conductor and motorman of a West Twelfth street car in Chicago. One of their methods of disabling the car was the cutting of the guide rope of the trolley pole, with the idea that the supply of motive power was thus shut off.

Boston capitalists are said to be behind a project to develop the water power of the Farmington River in Connecticut, and to operate an electric railway from Avon, New Hartford, Winsted and North Berkshire, with a branch line connecting Torrington and Winsted at Burrville. The company is incorporated under Maine laws with \$3,000,000 capital.

The new Niagara Gorge Railroad company, organized with a capital stock of \$1,000,000, has been incorporated. The company is organized to operate the famous Gorge road at Niagara, recently sold by the receiver. The company will also control the franchises of the Niagara Falls Tower company, the Buttery Whirlpool Rapids company, the Niagara Rapids View company and the Niagara Whirlpool Rapid Elevator company, all of which were owned by the dissolved railroad company. The capital stock is divided into 10,000 shares. The directors are Francis V. Greene, Avery D. Andrews and George V. Turner of New York, and

Herbert P. Bissell, Edward W. Eams, Clarence M. Bushnell, William C. Cornwall, J. Henry Metcalf, B. L. Jones and Herbert H. Hewitt of Buffalo. The new company began the operation of the Gorge road on June 4th.

The Indianapolis and Martinsville Transit company has secured right-of-way through Marion County, and also through Morgan County to Martinsville. The route is from Indianapolis southwest through Maywood, Valley Mills, West Newton, Friendswood, Brooklyn, Bethany Park, Center-ton, Matthews and Martinsville. The officers are: P. H. Fitzgerald, president; J. C. Tarkington, vice-president, general manager and purchasing agent; Joseph T. Elliott, Jr., secretary; Sterling R. Holt, treasurer.

The Galveston City street railway and the Gulf City street railway of Galveston, Texas, are to be sold on September 5th by order of foreclosure entered in the Federal Court of that district. An ordinance was introduced in the City Council of Galveston authorizing the purchaser of these two lines to consolidate them, and reaffirming all the rights and privileges the lines now enjoy. It also grants the purchaser franchise to build and operate lines on a number of other prominent streets of the city. This grant is to continue for a period of 25 years, at the expiration of which time the city is to have the right to purchase the lines.

AUTOMOBILES.

An American manufacturing company has just acquired an extensive piece of land and a plant at Coventry. The capital is said to be \$500,000, and the company means to rush the construction of automobiles, which has been rather neglected in England.

The Studebaker Bros. Manufacturing company of South Bend, Ind., is said to have closed contracts for the construction of automobiles aggregating in the neighborhood of \$1,000,000. New York and Boston capitalists are interested in the deal. In order to supply this new demand large additions to the works will be immediately erected. The cost of the new departments will be \$400,000.

An English correspondent says that considerable interest is being shown in automobiles in Great Britain. The dukes of Marlborough and Manchester are doing all they can to start the fashion. A great automobile show will be opened on June 17th, at Richmond, by Prince Edward of Saxe-Weimar. There will be tests of hill climbing and races between fast trotting horses and automobiles.

Dr. Playfair, the London physician who was condemned to pay \$50,000 damages for libel a few years ago, was hurt in a queer automobile accident recently. He was going up a hill when something gave way and the carriage began to roll backward down the slope. The driver applied the power brake to the rear wheels, forgetting that he was going backward, with the result that the carriage stood up on end and tipped backward, bruising Dr. Playfair as it fell upon him.

The National Bicycle and Motor company of Bridgeport, Conn., has been incorporated with a capital of \$2,500,000. All the stock is subscribed for by A. W. Paige, Judge George P. Carroll and Philip L. Holzer of Bridgeport. They represent capitalists, but at this time refuse to divulge their names. The purpose for which the company is organized is to manufacture, buy and sell bicycles, motor carriages, automobiles, autotrucks, electric vehicles, cars and conveyances and parts thereof, and all other kinds of articles made of wood or metal.

The automobile which left Cleveland, O., at seven o'clock on Monday morning, May 22d, to establish an automobile record between Cleveland and New York, arrived in front of the Astor House in the latter city at 5:45 p. m. on May 26th. The record made was 707.4 miles in 40 hours and four minutes of actual running. This is an average of 17.6 miles an hour. The trip was accomplished with only one accident of a serious nature—the breaking of an axle. Alexander Winton operated the vehicle, and was accompanied by George B. Shanks of the Cleveland Plain Dealer. This speed record was outdone, however, in France on May 24th. In the automobile race from Bordeaux to Paris, a distance of 333 miles, M. Charron won in a petroleum vehicle, covering the distance in 11 hours, 43 minutes and 22 seconds, beating the previous record by three hours, 35 minutes and 11 seconds. M. Charron claims that his automobile can maintain an average of 30 miles an hour for 12 hours. It has four seats and is of 14 horse power. The difference in speed in the United States and France is largely attributed to the respective conditions of the roads. However, an international race is proposed. M. Charron, winner of the automobile race from Paris to Bordeaux, authorizes the New York Tribune correspondent in Paris to enable his acceptance of Mr. Winton's challenge to French chauffeurs for a race in the United States over a course of 1,000 miles or less. The sum of 50,000 francs has already been subscribed by Charron's backers, it being understood that the prize is to be 100,000 francs. M. Charron, who has never

been in the United States, will be accompanied by the Chevalier René de Knyff, the well-known motor-carriage amateur, who was second in the recent Bordeaux-Paris race, and, as a member of the executive committee of the Automobile Club of France, will look after Charron's interests during his American trip.

PUBLICATIONS.

The catalogue of the Westinghouse Junior engine, issued by the Westinghouse Machine company of Pittsburg, is a handsome piece of work. It shows how the Junior engine, which is made in sizes running from five to 100 horse power, is a first-class product, although sold on a small margin of profit. A special bearing is made for the direct connection of these small engines to dynamos.

The Western Electric company is mailing to the trade a neat circular descriptive of the Matchless electric lighter. These lighters are made of the finest white china, and can be operated with batteries or connected to electric-light mains. They have the indorsement of the Board of Fire Underwriters. The Western Electric company also requests those persons interested in arc lamps who have not received a copy of its catalogue of Petite lamps to write for one.

The new catalogue "12" from the Ferracuta Machine company of Bridgeton, N. J., depicts the various styles of foot and power presses and other machinery manufactured by that company, many of which are especially adapted for electrical work of all kinds. Over 300 sizes and kinds of presses are described, and electrical-goods manufacturers will be especially pleased with the large double-crank presses, which are capable of cutting the largest size of armature disks. The Ferracuta company has recently placed on the market a new disk notcher, which is adapted for notching various sizes of armature disks, from three inches to 48 inches in diameter. This has proved of great interest. The company will be glad to send catalogue and full information about its tools to those interested.

TECHNICAL SCHOOLS.

The University of Michigan issues a "general announcement" for 1899-1900 of its Department of Engineering. The pamphlet describes the work of the department and gives a register of the alumni.

At a meeting of the Washington University board of trustees in St. Louis on May 27th President Brookings announced that he had secured from Samuel Cupples a building for civil engineering and architecture, to cost \$100,000, and \$150,000 toward the endowment of the school of engineering and architecture, thus making the aggregate gifts of Mr. Cupples, within the last 60 days, to this department of the university, \$400,000.

Entrance examinations for the Massachusetts Institute of Technology of Boston will be held in a large number of cities on June 20th and 30th. H. W. Tyler, the secretary of the school, can give all needful information. Announcement is made of extra summer courses during the months of June and July. These are private undertakings on the part of certain instructors and have the approval of the Institute. The courses include studies in mechanical drawing, mathematics, architecture, chemistry, physics (including mechanics, light, electricity, heat, physical measurements and electrical testing), mechanism and shopwork.

President Henry Morton of Stevens Institute of Technology, Hoboken, N. J., announces that Andrew Carnegie has offered to give \$50,000 to the fund now being raised for the purpose of building an engineering laboratory. Mr. Carnegie's generosity will enable the authorities of the institution to proceed without loss of time in erecting the new building and making other improvements at Stevens, including the construction of a chemical laboratory, which have been in contemplation for a long time. In his letter to President Morton, offering the gift, Mr. Carnegie said: "We owe much to Stevens, for many valuable men have come to us from it."

It is said that the most delicate calorimeter in the world is now in the possession of the Johns Hopkins University. It is an instrument for finding the relative quantity of heat in different qualities of coal, and was manufactured by I. W. Williams of Boston. It consists of a bomb, or heavy shell, about the size of a large orange, in which a small platinum crucible is suspended by a small wire, and a jacketed tank of water. A gramme of coal dust is compressed into a cake and placed in the platinum crucible. Then the sphere, after receiving oxygen under 375 pounds pressure, and being rendered air-tight by a screwcap, is immersed in the tank. By an electric spark the oxygen is ignited with the coal, and the increase of temperature in the water, caused by the combustion of the coal, is accurately measured by two delicate thermometers. The bomb is made of aluminum bronze, weighs about two pounds, and is coated on the inside with 20 coats of gold plating.

The chair of mechanical engineering in McGill University, Montreal, rendered vacant by the departure of Professor I. T. Nicholson to the new technical school in Manchester, has been filled by

the appointment of R. J. Durlay, who has been assistant professor since 1897. Mr. Durlay is a science graduate of London University.

MISCELLANEOUS.

Commissioner Peck announces that he has prevailed upon Mr. Edison to make a special exhibit of his electrical inventions at the Paris Exposition next year.

A dispatch from Germany in the daily papers states that an electro-technical congress was opened on May 26th at Göttingen, Hanover. There were 150 delegates in attendance, it is said.

The boom in copper has caused such increased activity in the Lake Superior copper region that there is a great scarcity of dwellings for the numbers of miners and workmen who have lately gone into the district. All the available houses are occupied and hundreds of men working at the mines and mills are unable to bring their families there for lack of a roof to shelter them. Preparations are being made for the building of modern tenement flats at Houghton and other points on the lake.

What is said to be the biggest zinc-mining deal ever made in the Missouri-Kansas district was consummated at Joplin, Mo., on June 1st. Colley & Co., Boston bankers, purchased the Rogers & Miner 80-acre tract of mineral land at Aurora, and 458 acres adjoining, known as the Flourney farm, for \$800,000. The property bought contains three rich zinc mines, the No. 1, Prosperity and Tuttle mines, which are producing about 250 tons of zinc ore a week. It is said that this property was bought 10 years ago by A. H. Rogers and S. H. Miner for \$85.

The National Exposition of Electrical Arts, which will be held at Tattersall's, Chicago, from September 25th to October 9th, gives promise of assuming greater proportions than the officers of the exposition hoped for. Active preparations for this exposition are now being made, and applications for space are already beginning to come in. President N. J. Heimbach, Manager W. E. Burnham and Secretary T. Carrabine feel much elated at the interest shown by the electrical fraternity in the coming exposition. The company will be pleased to send full particulars to those interested.

Comparing the machine-shop methods of American and British manufacturers, with the Atbara bridge incident as a text, a writer in Cassier's Magazine says: "Electrically driven shop tools, heavy ones as well as light ones, have eliminated many difficulties of operation, and electric cranes have greatly simplified the handling of heavy pieces. The principle of portability in the tools, moreover, has been applied to the widest possible extent, and, in itself, has contributed almost as much as any one other thing to that rapidity and excellence of output for which American shops have become noted."

TRADE NEWS.

The general offices of the Electric Storage Battery company have been removed to its factory building, Nineteenth street and Allegheny avenue, Philadelphia.

The W. J. Tindall company of Cohoes, N. Y., has been incorporated, to manufacture and sell electrical appliances for medical and surgical uses. The authorized capital is \$3,000, and the directors are William J. Tindall and Philo A. Turner of Cohoes and Charles A. Tindall and Edward E. Gardner of New York.

A recent advertisement made Mr. W. N. Matthews of 312 Commercial building, St. Louis, says that the Missouri-Edison company of that city is "substitut-

ing smaller units for large ones," whereas the true state of the case, of course, is precisely the reverse. Mr. Matthews offers the superseded machines for sale. The error was made in transcribing the notes of a stenographer.

In a recent baseball game that created considerable excitement in Warren, O., the team of the New York and Ohio company beat the aggregation of the Warren Electric and Specialty company by a score of 15 to 11. After lasting 3¼ hours the game was called in the seventh inning on account of darkness. The losers thought that if the full nine innings had been played they would have won.

BUSINESS.

Siegel, Cooper & Co., Chicago, have placed an order with the Western Electric company for one 125-kilowatt direct-current generator and one 80-light arc dynamo. These machines are to be installed in the buyers' store in Chicago.

Notwithstanding the fact that the spring season was not warm enough to be an ideal season for the fan-motor business, the Electric Appliance company of 92 and 94 West Van Buren street, Chicago, reports that its sales of fan motors up to date are very encouraging and indicate that the demand during the season will be very heavy.

The 36-inch water wheel set up by the American Impulse Wheel company of New York in the Massachusetts Institute of Technology showed an efficiency of over 80 per cent., the manufacturer states, on the first test, before the bearings had worn smooth. In design and finish it is running satisfactorily. "This," says the American company, "adds only another testimony to the many before given that the water-wheels of this company are superior in design, mechanical workmanship and efficiency. Wherever we have installed wheels the same report comes back—that the machines are giving perfect satisfaction."

The Western Electrical Supply company of St. Louis is keeping pace with the times with its usual spirit of push and energy, and is always picking up good things for the trade in general. The company's numerous salesmen are at the present time "hustling" for business in nearly every locality in the central, western and southern states, and from their genial attitude and general appearance of being thoroughly satisfied with themselves and the world in general, they are evidently receiving their share of the patronage. This state of affairs is but natural, however, considering the general high quality of goods that are handled by the house they represent.

The active condition of the rheostat business at the present time is one of the best proofs of large sales and good prospects for the manufacturer of motors and dynamos. The Iron Clad Resistance company of Westfield, N. J., is one of those manufacturers that find themselves in an overwhelmed condition, but this company is in a position to increase factory facilities to meet every demand. The personnel of this institution is well known to the trade. R. H. Mansfield, Jr., is president, A. W. Berresford, vice-president, and A. P. Munning is secretary and treasurer. The Iron Clad Resistance company makes a full line of theater dimmers, dynamo-field rheostats, motor-starting and motor-regulating rheostats, ventilating-fan controllers, also special rheostats and resistance plates. It is the purpose of the company from now on to push its goods aggressively in the western market. In a short time there will be available to the trade detailed information of a special dimmer the company is now introducing.

"It is surprising," said J. J. Wood of the Fort Wayne Electric Works, "the immense amount of business that is being done in the electrical line.

We have been necessarily handicapped while perfecting our new organization, but in spite of all this, we are running our factory full time and have been obliged to add several hundred men to our factory force within the last week or two."

The Knutson arc-lamp clutch placed on the market by A. W. Knutson & Co. of Galzburg, Ill., is meeting with great success. The device seems in truth to "fill a long felt want," and it is said to overcome the troubles of the arc-lamp trimmer. The manufacturers state that hundreds of dollars in lamp repairs may be saved by the use of the Knutson clutch. The electric-light company of Galzburg, which is using this clutch, informs Knutson & Co. that it saved in the neighborhood of \$200 in lamp repairs by the use of the Knutson clutch. Other letters, speaking in the highest terms of the device, are being received.

The Montauk automatic thermostatic fire-detective cable covers a field which, heretofore, electrically speaking, has been but tentatively occupied, and installations of it are rapidly multiplying. Stanley & Patterson of New York, a firm well known to the electrical trade, and jobbers of this cable, among other installations have recently placed an equipment in the home of Mr. Joseph Pulitzer of the New York World; Doscher & Hartwell, electrical contractors, among other installations, have recently equipped the winter residence of Mr. George Taylor in New York city, and also his summer residence on Long Island; the Jenney Construction company is doing a good business in the installation of this cable, and among the installations made by it may be mentioned the winter and summer residences of Mr. A. A. Cowles, president of the Ansonia Brass and Copper company. Among the various installations made by the Gamewell Auxiliary Fire-alarm company, the Dundee Chemical Works, Passaic, N. J., and the Jessup & Moore Paper Mills, Wilmington, Del., may be cited.

The Metropolitan Steam Boiler Compound Manufacturing company of Brooklyn is now making an especial drive for business among the electric-light stations and other electric-power plants of the West and Middle West. The Metropolitan company refers to itself as a "boiler doctor," and it offers engineers and others having boilers in charge "consultation free." In a word, the Metropolitan company analyzes feed water and prescribes and cures the particular disease with which the boiler is afflicted. It is particularly interested in securing western business, and it offers to mail to any engineer sending the company the horse power of his plant, with his home and business address, a valuable morocco-leather-covered note-book. President Edward E. Graves of the Metropolitan company is full of enterprise, and his offer of "a valuable water-front lot in Kings County, Greater New York," as an inducement to chief engineers to send their business and private address, shows that he knows how to bring his goods to the attention of those interested. Mr. Graves offers to reasons, as follows, why level-headed men use the Metropolitan compound to prevent the destruction of their steam boilers: "First, it removes and prevents scaling, pitting, corroding and foaming; second, it is absolutely safe and perfectly harmless; third, it preserves and does not injure the iron; fourth, it reduces interruption to service by avoiding frequent opening of boilers; fifth, it insures safety by removing the great causes of explosion; sixth, it is the cheapest, because after boilers are free from incrustation, it requires but a small quantity to keep them clean; seventh, it has no equal; a trial will insure so that you would not be without it; eighth, the annual saving of coal from 15 to 70 per cent.; ninth, cheaper than any product in the market, its benefits taken into consideration, and tenth, 25 years on the market."

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued May 30, 1899.

625,763. Ground Detector. Edward M. Hewlett, Schenectady, N. Y. Application filed December 12, 1898.

A polyphase distribution system, a polyphase resistance having a number of branches connected across the lines and a common junction, and one or more static measuring instruments connected between ground and intermediate points in the resistance branches.

625,786. Electric-lighting Device. Samuel E. Mosher, Chillicothe, O. Application filed February 28, 1898.

A sparking device comprises a standard, two sparking members movably connected with the standard, one of the sparking members movable independent of the other and yieldingly connected therewith, and means for moving one of the members.

625,787. Electric-lighting Device. Samuel E. Mosher, Chillicothe, O. Application filed March 21, 1898.

An electrical lighting device is described comprising sparking members, one supporting the other and insulated therefrom, one of the sparking members being movable in relation to the other, an endwise moving support, a stop for the movable sparking member and a spring for holding the movable sparking member out of contact with its contacting sparking member whereby the parts are adapted to operate as described.

625,788. Electric-lighting Device. Samuel E. Mosher, Chillicothe, O. Application filed May 2, 1898.

A sparking mechanism consists of a swinging member, relatively movable sparking members, both of the members connected with the swing member and the point of connection of one being farther away from the pivotal point of the swinging member than the other, whereby one sparking member is caused to move past the other when the swinging member is actuated.

625,792. Electromagnetic Mechanism for Actuating Engine Valves. Ernest W. Naylor, Philadelphia, Pa. Application filed August 2, 1898.

As a circuit controller for electrically actuated valves there is a rotating disk having one or more sickle-shaped contact plates on its face, with their inner edge or edges formed in a curve receding from the center of the disk.

625,797. Telephone Switchboard. James M. Overshiner, Elwood, Ind. Application filed March 1, 1899.

The combination is described of a jack, a drop having an independently movable part and a plug constructed and adapted to enter the jack and to engage the movable part on the drop so as to restore the latter only when the plug is withdrawn.

625,806. Operating Dynamo-electric Machines. Edwin W. Rice, Jr., Schenectady, N. Y. Application filed March 1, 1897.

In an end-play device for rotary converters, the combination with the shaft of the rotary converter of an irradial, annular magnetizing coil mounted in inductive relation to the end of the shaft and with its axes substantially coincident with that of the shaft, and means for passing a magnetizing current through the coil and for varying the value of the magnetizing current.

625,816. System of Electrical Distribution. Elhu Thomson, Swampscott, Mass. Application filed September 10, 1897.

One claim is for the combination with constant potential mains of a circuit across the mains containing a number of transformer secondaries of the constant-potential type connected in series, with translating devices between them, and a regulating device connected in the series circuit and tending to maintain constant current therein.

625,823. Telegraphy by Means of Electric Light. Karl Zickler, Brunn, Austria-Hungary. Application filed June 24, 1898.

The sender apparatus has means for producing and intermittently projecting a pencil of ultra-violet rays in the direction of a receiving apparatus, which has an anodized electrode chamber containing rarefied gas between a disk-

shaped cathode electrode to receive the rays projected from the sender, and an anode mounted in proximity to the cathode and means for utilizing the sparks produced between the electrodes by the ultra-violet rays.

625,828. Cable Coupling. Frank E. Case, Schenectady, N. Y. Application filed March 21, 1898.

A cable section is composed of a plurality of separate wires of smaller cables, a terminal for each wire, an insulating support for holding and spacing the terminals, each terminal being provided with a projection or hook for holding the cable section in place, and a projection which acts as a lever to assist in releasing the terminal.

625,830. Inspector's Indicating Wattmeter. Frank P. Cox, Lynn, Mass. Application filed February 18, 1899.

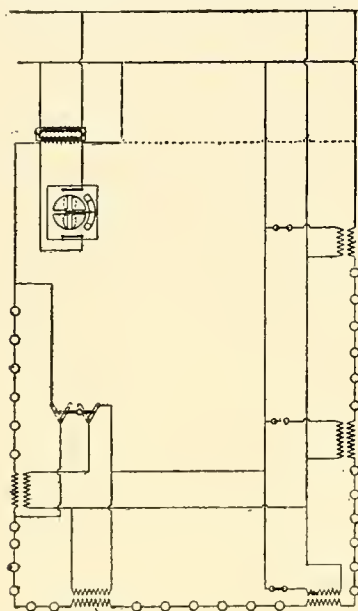
A box contains the working parts of the apparatus, comprising a flat plate having holes therein to permit the insertion of the lamps, which plate is supported within the box, sockets mounted between the plate and the base of the instrument, and means for preventing foreign substances from entering the instrument case through the openings in the plate.

625,875. Electrically Controlled and Operated Railway Signal. William Daves, Jersey City, N. J. Application filed December 12, 1898.

A relay in the track circuit is arranged to be cut out by the presence of a train on the rails within the circuit, a motor circuit is closed and opened at the relay, and has intermediate separable contacts therein, a time circuit is primarily opened and closed at the relay and has intermediate contacts to open and close the circuit, and a time mechanism is operated by the time circuit and interposed therein to break the motor circuit and the time circuit, and a make-and-break device in the time circuit imparts intermittent motion to the time mechanism.

625,915. Controller. Thorsten von Zweigbergk, Cleveland, O. Application filed February 27, 1899.

The combination of a governing switch and two independent handles, either adapted to operate the switch, one to govern motors in running and the other to apply an electric brake.



NO. 625,816.

625,921. Rotary Circuit-breaker. Hans Boas, Berlin, Germany. Application filed October 20, 1898.

A rotary circuit-breaker comprises a receptacle containing a conducting fluid, a centrifugal apparatus having a vertical tube dipping into the receptacle and a rotating horizontal tube in combination with a metallic segmental ring or tube, against which the conducting fluid is ejected.

625,923. Magnet-bell Striker. Richard Brueckner, Boston, Mass. Application filed October 29, 1898.

A permanent magnet has electromagnetic coils wound on cores secured to one polar extremity thereof, an armature-supporting yoke fitted upon the ends of the cores and a projection from the yoke extending to the other polar extremity of the permanent magnet to retain the armature yoke in position.

625,938. Accumulator Plate. Harry G. Osburn, Chicago, Ill. Application filed July 27, 1898.

An accumulator plate is formed of a sheet of metal and has a series of sections joined to the body of the plate by narrow necks at opposite ends of the sections and bent or twisted into transverse positions to form the side walls of transverse pockets.

625,953. Electric Device for Propelling and Controlling Vehicles. Rudolph M. Hunter, Philadelphia, Pa. Application filed March 29, 1899.

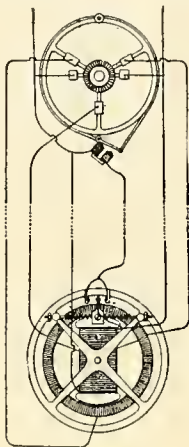
An electric motive mechanism for vehicles consisting of a battery box having a pivot connection for attachment to a vehicle body, springs and axles for sustaining the battery box, a pair of driving wheels, two electric motors for respectively rotating the wheels, one or more steering wheels also supporting the battery box, means for adjusting the angle of the steering wheels, and a battery in the box for supplying current to the motors.

626,009. Transmitting Movement to a Distance By Electromagnetic Mechanism. Emile Raverot and Pierre Belly, Paris, France. Application filed July 27, 1898.

An automatic reversing switch for an electric motor consists of two electromagnets in multiple arc, means for breaking the circuit of each electromagnet, an armature for each electromagnet, each armature carrying two separate contact arms, a stationary contact co-operating with each arm, two supply mains, each connected with two diagonally opposite contact arms, and two distributing mains, each connected with two directly opposite stationary contacts.

626,017. Incandescent Electric Lamp. Ralph W. Carroll, Blandinsville, Ill. Application filed July 1, 1898.

An incandescent electric lamp comprising a socket casing, an insulating socket block mounted therein, an insulating disk mounted above the socket block whereby a chamber is formed between the socket block and the disk, metal standards connecting the block and disk, binding posts passing through the disk and connecting with two of the standards, a plurality of contact springs secured to the socket block, a switch mounted in two of the standards, one of which is connected with one of the binding posts, the switch being cylindrical in form and provided with segmental contact plates of varying length adapted to make connection with the springs, a plurality of conductors passing through the socket block, one of which is connected with one of the standards which is connected with another of the binding posts, and the others of which conductors are connected with the springs, and a detachable bulb provided with a plurality of filaments and a plurality of annular contact plates in electrical connection therewith and which are connected with the conductors in the socket block by means of a plurality of annular contact plates.



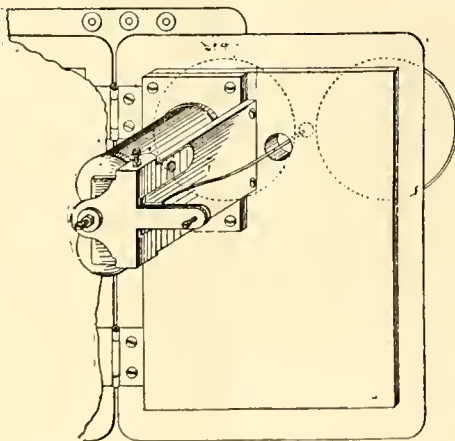
NO. 626,009.

626,020. Mechanism for Starting, Stopping and Reversing Direction of Motion of Electric Motors and for Controlling Speed of Same. Frank H. Foster, New York, N. Y. Application filed July 8, 1898.

The combination is described with a current controller and a source of electric-current supply of an electromagnet and controlling devices intermediate the electromagnet and the current controller, whereby such current controller when brought into operation may be moved forward with a variable motion, and the variation in this motion at different portions of the travel of the controller predetermined and made uniform at all times.

626,033. Electrolytic Apparatus and Process of Treating Impregnators Therefor. Marcel Perreux-Lloyd, Paris, France. Application filed July 9, 1898.

The process of treating impregnators for use in electrolytic apparatus consists in thoroughly impregnating the impregator with a solution of formic aldehyde and subsequently rendering the aldehyde inert or inoperative by treating the impregator in a bath of commercial acetic acid.



NO. 626,131.

625,065. Insulator. Welles E. Holmes, Newton, Mass. Application filed February 16, 1899.

An insulator comprising a clamp adapted to loosely engage a conductor, a spool of insulating material having a socket to detachably receive the clamp and a support for the spool.

626,114. Telephone-connecting Circuit. George K. Thomson, Malden, and Thomas C. Wales, Jr., Newton, Mass. Application filed August 6, 1898.

The trunk circuit has a repeating coil with four windings normally in series in pairs with the respective conductors of the circuit and an electromagnetic switching device, while a cord circuit is divided by a repeating coil of four windings, with a battery signaling keys and a disconnected source of calling current in the calling plug circuit, with a party relay sub-station circuit having a call bell in a ground branch from each conductor thereof, whereby when the trunk circuit is connected between the cord circuit and the relay circuit current from the battery circulates through the circuit thus organized, and by manipulating the keys the call bells are selectively operated.

626,131. Selective Electric Signal. John A. Barrett, Summit, N. J. Application filed July 28, 1898.

An electromotive appliance consists of two iron cores normally and permanently magnetized with like polarity and magnetization-modifying helices or windings surrounding the cores respectively, combined with a permanently magnetized armature common to and as a whole polarized oppositely to the poles of both of the cores, the armature being normally attracted to the poles by these co-operatively opposed polarities, and adapted to be repelled therefrom only when such currents are caused to pass through the windings of both cores, as to reverse the polarity of the poles of both simultaneously.

626,132. Selective Privacy-switch for Multiple-station Telephone Lines. John A. Barrett, Summit, N. J. Application filed July 28, 1898.

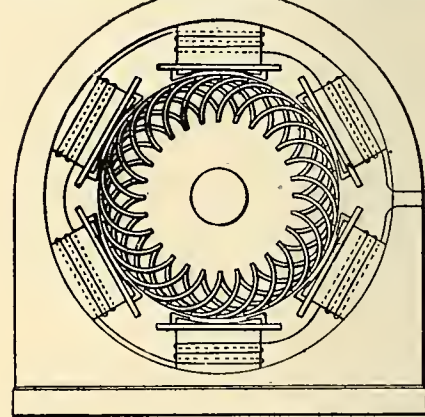
Claim is made for the combination with the line conductors of a multiple-station telephone line and the telephones at the stations thereof of a privacy device at each station determining the operative condition of the telephone, the actuating magnet of the device being connected with the line conductors, and the privacy devices at all of the stations being organized to act simultaneously to simultaneously render all telephones operative or inoperative, the circuit connections of the different privacy devices being arranged in diverse combinations, and means at the central office for producing in the line specialized currents adapted to actuate any corresponding privacy device through the agency of the circuit combinations.

626,134. Prepayment Electrical Meter. Charles O. Bastian, London, England. Application filed December 13, 1897.

A circuit-closer for the main circuit has a spring arm adapted to be struck by a lug and to be moved into the position to close the main circuit through the meter, during the partial rotation of a spindle set in motion by the insertion of a coin. A spring catch is adapted to engage the circuit-closer in its closed position; a spring tends to hold the circuit-closer out of contact, and a magnet in the local circuit is adapted to become energized and to release the catch from the circuit-closer and break the main circuit.

626,135. Electrolytic Meter. Charles O. Bastian, London, England. Application filed September 26, 1898.

The meter consists of a glass frame or open-work support with thin sheets or surfaces of platinum mounted opposite one another on the frame so that the sheets cannot come in contact, means for securing the sheets to the frame, and platinum wires connected to the platinum sheets and also connected to the circuit wires.



NO. 626,172.

626,143. Insulated Joint for Electric Fixtures. Edmund E. Clift, Philadelphia, Pa. Application filed February 8, 1899.

The combination contains two flanged sections, each having an extension adapted to be coupled to a pipe, a screw threaded on the flange of one section, an internally flanged coupling section adapted to the threaded flange, a screw connecting the coupling section to the other flanged section, non-conducting material between the several sections, and a non-conducting thimble extending through the openings in the two flanged sections.

626,146. Telephone Toll Circuit. Henry M. Crane, Boston, and Thomas C. Wales, Jr., Newton, Mass. Application filed May 25, 1898.

The combination is a toll trunking circuit multiplied to a plurality of sections, at which sections three distinct operative functions are performed; of means at the first section for receiving a call from a sub-station and for switching the trunk circuit thereto, means at the second section for rectifying obstructions in the circuit so made up, and means at the third section for connecting the trunk circuit to the called-for circuit, with an automatic disconnecting signal at the first section.

626,168. Trolley Catcher. Frank N. Kelsey, New Haven, Conn. Application filed December 14, 1898.

In a trolley catch the combination of a casing having a stationary arbor, a rotative device on the arbor, a trolley arm connected with the rotative device, a locker for the latter, a detent for holding the locker in its inoperative position, and a centrifugally operated trip device for the detent carried by the rotative device.

626,172. Rotary Transformer or Synchronous Motor. Benjamin G. Lamme, Pittsburg, Pa. Application filed July 24, 1897.

A rotary transformer or synchronous alternating-current motor, the field-magnet pole pieces of which are provided with combined low-resistance, non-magnetic rings and coil shields, for counteracting the field distortion caused by armature reaction.

626,190. Electric Arc Lamp. John R. Pepin, Chicago, Ill. Application filed October 28, 1898.

The essential features are an electromagnet, a central tube, a soft iron core, a tube within the core, a rod and piston, a clutch pivoted to a lug on the tube, a rod pivoted on the clutch, a bracket, a flange or base-supporting magnet, a carbon held in the carbon-holding tube, and a collar adjusted by a set screw to a carbon-holding tube adapted to hold the tube and the carbon when the lamp is dead.

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No. 24

Electric Transfer Table.

The practice of the Chicago City Railway company is to overhaul every part of its rolling stock at least once a year. This entails the handling of the cars several times during their progress through the shops and early impressed upon the management the necessity of employing some means of shifting them about quickly and economically. Before the system was equipped electrically and the lines extended to all parts of the South Division, the cable cars were pushed from one part of the repair shops to the other by laborers, but the increase in the number of cars and the additional

large open car is shown on the table. The picture was taken while the table was in service carrying cars from one end of the shop to the other.

A view of the table itself (Fig. 2) without a car is presented on page 338, showing the peculiar construction of the truck. The electrical equipment is placed in the front of the car, which has a raised platform upon which the motorman stands. A No. 3 Westinghouse motor of 25 horse power capacity is suspended from the car axle in the ordinary manner. Current is taken from the company's regular railway circuit. Two overhead wires are employed, and a special trolley with two prongs and wheels

Twenty-first and Twentieth streets, in the rear of the company's offices and cable plant. The overhead trolley wires are fastened securely above the track and the trolley pressed against them, as it is desirable that the connection shall not be broken. On both sides of the track, all through the shop, tracks are placed at regular intervals upon which the cars are shifted for inspection and repairs.

When the cars are brought in from the bays or off the road for repairs, they are taken up to the second floor on the electric elevator already described in the *Western Electrician*, run onto the transfer table and shifted to the department of the

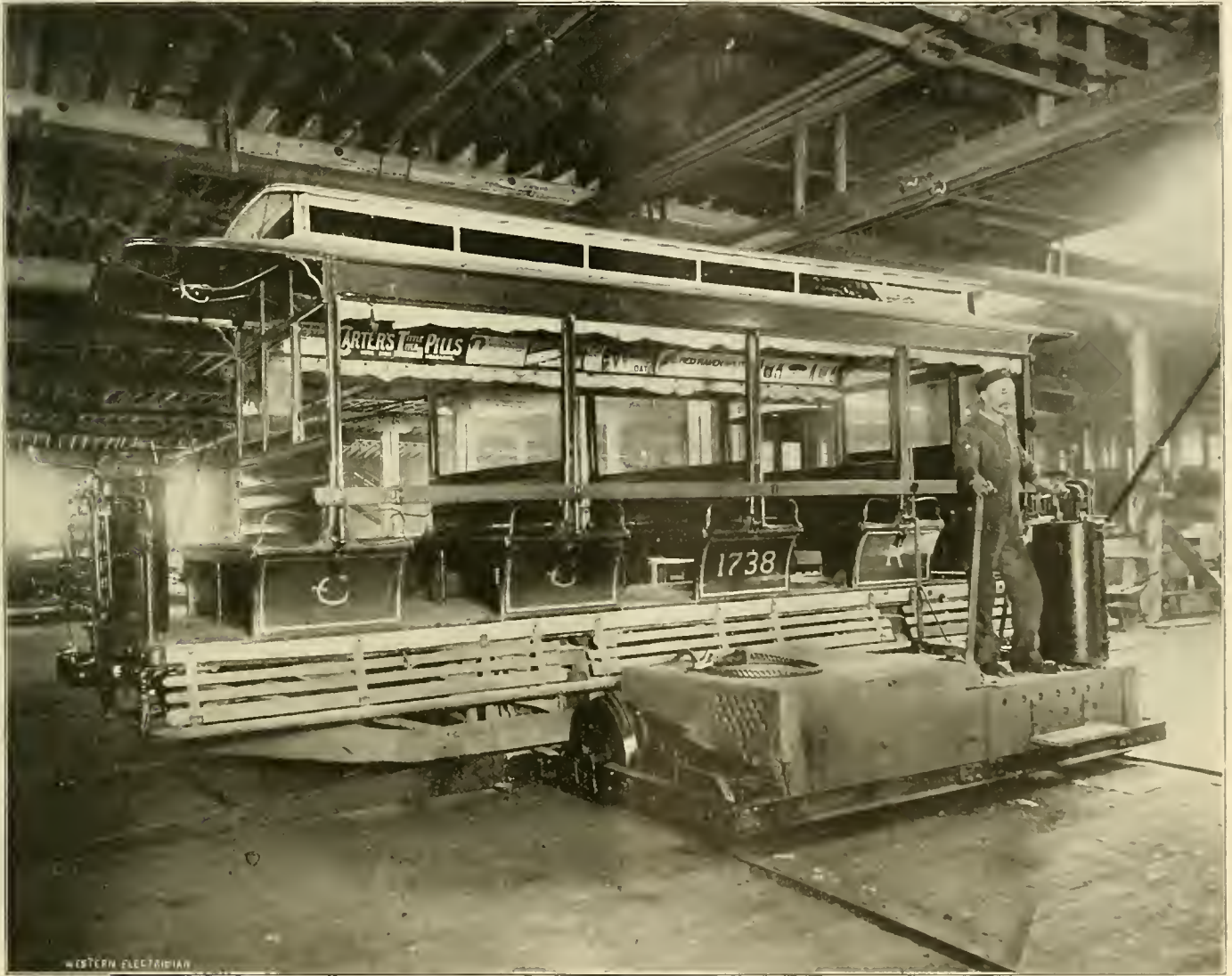


FIG. 1. ELECTRIC TRANSFER TABLE.—MOVING CAR IN CHICAGO CITY RAILWAY COMPANY'S REPAIR SHOPS.

weight of the motors following the introduction of electricity made it a serious problem to handle them in this manner.

Some idea of the nature of the task may be gained from the fact that when the cars are taken off the road at the end of the season the car bodies are cleaned and painted, cushions are cleaned and repaired, curtains washed, and the trucks, running gear and motor equipments examined and repaired, thus sending every car of the several thousand employed through all departments of the shops at least once every year.

During the last year the company has been experimenting with mechanically operated transfer tables for the purpose of facilitating the movement of the cars from one department to another. As a result of these experiments Charles E. Moore, the master mechanic of the company, constructed the large transfer table shown in the accompanying illustration. This transfer table is capable of carrying the largest and heaviest car operated by the company. In the illustration (Fig. 1) on this page a

makes contact with these wires and completes the circuit which conveys the current to the motor. Two rheostats are connected in series with the motor, and a third, of two panels, is connected in shunt with the field to cut down the speed. At the left of the platform is a G. E. controller and behind it a lever which controls a clutch, by means of which the motor may be made to propel the transfer table or operate a drum on which is wound a rope used for hauling the cars on the truck. It is a very simple and efficient arrangement, and has proved very successful. The electrical equipment was installed by William C. Bryant, an electrician of the company.

The peculiar construction of the device enables the operators to run the cars onto the table directly from the tracks on the floor, the iron bridging between the front and back axles being depressed so that it barely clears the floor.

The track upon which the transfer table runs extends through the center of the second floor of the repair shops, which are on Dearborn street, between

shops in which the repair work is to be begun. After this the car may be moved half a dozen times before it is ready for service, and it is in this work that the transfer table comes into play. It has proved a great time-saver and an economical device.

Chicago Union Traction Company.

Mr. Egbert Jamieson, the general counsel of the North Chicago Street Railroad company, who was offered the presidency of the new Chicago Union Traction company, about to be incorporated to consolidate the North and West Side surface street-railway systems of Chicago, has, it is believed, declined the position. Whether Mr. John M. Roach will be made the general manager of the consolidated system is not known. Mr. Roach, who is now general manager of the North Chicago system, has been mentioned in connection with the position, but at this writing it appears that none of the officers of the new company has been settled upon. Undoubtedly, an organization will be effected in a few days.

Rotary Transformers and Storage Batteries as Related to Long-distance Transmission.¹

By WILLIAM LISPENARD ROBB.

This paper is intended not as a general treatment of the subject of rotary transformers and storage batteries, but rather as a statement of the conditions under which we operate at Hartford, of the difficulties met with in the operation of that particular plant, the way in which these difficulties have been overcome, and the advantages that have been found in the operation of the rotary transformers and battery.

The main source of power is water power on the Farmington River, approximately 11 miles from Hartford. The water power at present developed is capable, under the most favorable conditions, of delivering at the switchboard in Hartford about 1,200 electrical horse power. The power is generated by two 600-kilowatt alternators and transmitted to Hartford on the three-phase system under 10,000 volts pressure.

The water power is supplemented by an auxiliary steam plant in Hartford, consisting of two compound, condensing Couper-Corliss engines, having a combined capacity of 1,600 horse power. These engines supply the power to operate one 600-kilowatt alternator and one 400-kilowatt rotary transformer so arranged that it can be connected with engines and operated as a direct or alternating-cur-

rent generator. This rotary is so operated whenever, owing to low water or repairs on the transmission line, the supply of alternating current is insufficient for the alternating-current load and all the rotary transformers.

Two systems of distribution are used. In the central portion of the city the distribution is on the three-wire, 220-volt, direct-current system. This part of the service is practically all underground. The feeders are lead-covered cables drawn in cement-lined ducts. The distribution is in part by Edison tubes and in part by lead-covered cables drawn in ducts. Outside the central portion of the city the feeders are supplied with two-phase alternating current under 2,400 volts pressure, and the distribution is, in general, on three-wire, 220-volt systems, supplied from 10 or 20-kilowatt transformers, although a few smaller transformers are still in service. This service is in part underground, but, in general, overhead. Constant-potential, enclosed-arc lamps, incandescent lamps and motors, in the case of both alternating and direct currents, are operated on the same three-wire system. All the commercial arc lamps, whether on the direct or alternating system, are of the constant-potential, enclosed type, as are also the street lamps in streets in which there is a three-wire system. In other streets the street lamps are of the series alternating-current enclosed-arc type, and are operated from constant-current transformers.

Three rotary transformers supply direct current to the three-wire, direct-current system. One has a capacity of 400 kilowatts, and is located at the steam plant. Two have a capacity of 250 kilowatts each and are located in a battery sub-station, which is situated in the heart of the business section of

the city, and about three-quarters of a mile from the steam plant. The storage battery has a capacity of 2,500 horse power hours at a five-hour rate of discharge. The 250-kilowatt rotaries and the battery were installed in the fall of 1896 and the 400-kilowatt rotary in the fall of 1898. All three rotaries and the battery supply currents to the same three-wire system.

The three alternators are always operated in parallel. At least one rotary transformer and storage battery are always connected to the three-wire, direct-current system. The direct and alternating-current systems are consequently interlocked, and the whole plant, including alternators, rotary transformers and battery, is practically operated in parallel.

The rotary transformers are of the two-phase type, and are so designed that by cutting in or out turns of the primary of the static transformers the voltage of the rotaries may be varied between 230 and 360 volts. This wide range of voltage is necessitated by the fact that the rotaries are at times run directly on the line, and at other times used in charging the battery, frequently at high charging rates. This wide range of voltage that can be obtained from the rotary does away with the boosters, otherwise necessary in charging.

The rotary transformers are two-wire and simply supply the current to the outside wires of the three-wire system. The neutral wire is connected with the middle point of the secondaries of the two static transformers. This point is always midway, as re-

they are used for running machinery in factories, and, consequently, are only started twice a day—we find no practical difficulty in operating induction motors and lights from the same system of distribution.

The three alternators, one operated by steam and the other two operated by water power at a distance of 11 miles from the first, have been continuously run parallel during the past three years. No difficulty whatsoever has been found in this method of operation.

The operation of the rotary transformers has not been so simple a matter. At the outset there was great excess of sparking at the commutator. This sparking was soon found to depend very largely on the variety of brushes used. It was found that a very soft carbon brush gave the best results, but, without special treatment of the brushes, sparking, although diminished, is still excessive. The method of treating the brushes suggested by our superintendent, Mr. Rollins, was tried and found effective. The carbon brushes are first raised to a red heat, and then plunged in ordinary lubricating oil and allowed to cool. When brushes treated in this manner were used all vicious sparking was stopped, and in this particular the transformers ran as smoothly as direct-current generators of the best type. At the outset, in operating the rotaries, considerable difficulty was met with in preventing pumping when the engines were supplying power to the system. This pumping could be traced to the variation in the angular speed of the engines, and when the water power alone was supplying the power there was little, if any, pumping. It was found that this tendency to pumping could be checked by varying the field excitation of the rotary transformers or by temporarily throwing a portion of the load on the storage battery. Only once in the past three years has the pumping been such as to cause any serious interruption. The switchboard at the sub-station was originally arranged to give the greatest possible flexibility in operation. Both rotaries could be run in multiple with the battery, or both rotaries could be run in multiple feeding into the line and the excess of current used to charge the battery, or one rotary could be run on the line and the second rotary used to charge the battery independently. This last method of operation was found impracticable. Under this condition the pumping would immediately begin, and it necessitated giving up this method of operation. Notwithstanding the above-mentioned difficulties, when a year ago it was decided to increase the direct-current machinery, we had gained sufficient confidence in the rotary system to purchase a 400-kilowatt rotary rather than a direct-current generator.

The third rotary, when tested, proved to be free from any tendency toward pumping, either when operated from the steam plant or from the water power, and was in every way as nearly perfect as a machine could be. However, when thrown on the line with the two older rotaries, they immediately began pumping, and it was found impossible to run the three rotaries together. The pumping in a rotary system seems to be cumulative; it is very easy to stop it if the proper remedy is applied as soon as the first tendency to pump is noticed. If allowed to go on it quickly gets beyond control. The impossibility of running the three rotaries together necessitated some change. The Westinghouse company's engineers maintained that the corrective device could be applied with equal effect to any one of the three rotaries. Copper strips were attached to the pole-pieces of the 400-kilowatt rotary. This rotary, of itself, was all right, but the developing of any tendency of the system toward pumping was entirely overcome by means of these copper strips. The system now works perfectly, whether operated by steam or water power. Even under the trying conditions of running the rotaries under different voltages, two feeding directly into the line and the third independently charging the battery, no trouble with pumping is experienced. In all other respects the rotary transformers have been all that could be asked for; they have run practically continuously night and day for nearly three years, and have had practically no repairs, the commutators simply being turned down once or twice a year.

With storage batteries one looks for frequent renewals of plates. The Hartford battery has had its share of renewals. The battery was bought under a five-year guarantee, which has since been renewed for five additional years. The renewals have not been in excess of what was expected, and no investment of the company has been considered more satisfactory than the battery. The method of deciding when the battery is to be renewed under the guarantee is perhaps interesting. Whenever any plate or number of plates have lost one-third of the original capacity they are replaced by new plates. In this way the battery is being continually renewed, and its capacity should never be less than 90 per cent. of its original capacity.

The four accompanying charts, made from the daily records of the company, represent the load on Wednesday, November 23, and Saturday, November 26, 1898.

The part shaded with horizontal lines represents the alternating-current load, the upper portion representing the series arc street lights. The part shaded with diagonal lines represents the charge and discharge of storage battery, lines sloping to

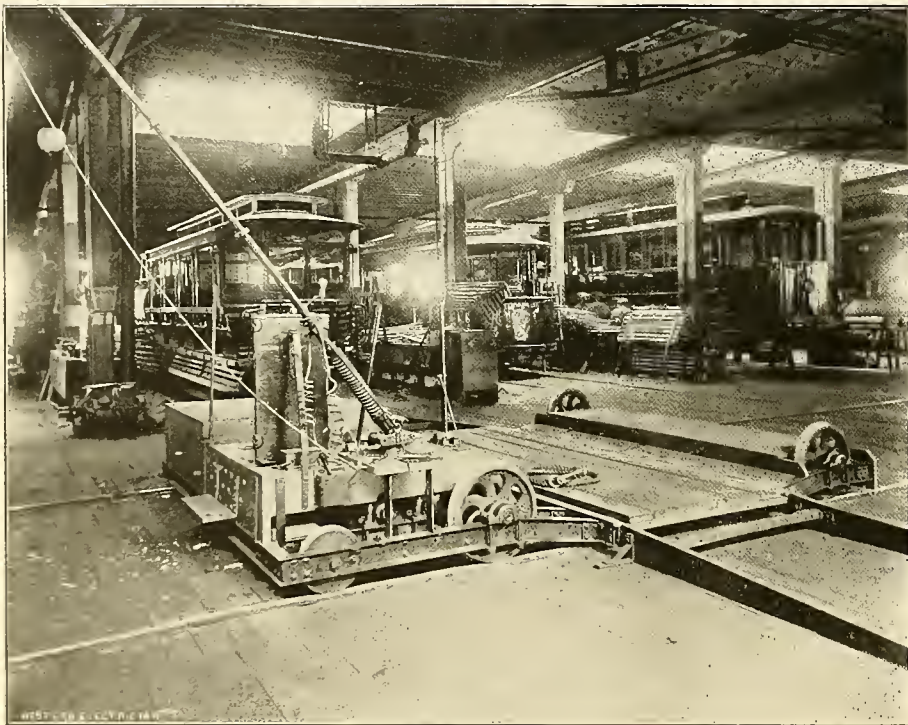


FIG. 2. ELECTRIC TRANSFER TABLE.—SIDE VIEW, SHOWING CONSTRUCTION.

gards electric pressure, between the two terminals of the rotary transformer.

The storage battery is at all times kept on the line for the purpose of regulation and to meet any emergency call for extra power.

It was necessary to generate alternating current rather than direct current, as the main source of power is located 11 miles from the center of distribution. This condition very generally applies to water powers that have not already been developed for other purposes than the production of electricity. The same condition applies in the case of companies supplying large areas when it is desired to supply all the power from one central power plant, so located that the power can be produced at the minimum cost. In the Hartford case, at the auxiliary steam plant, one generator supplies alternating current. The second generator, which in its normal use is a rotary transformer, when supplied with mechanical power from the engines, furnishes both alternating and direct current to the system in any proportions that may be desired.

Two of the rotaries are started and brought into synchronism by induction motors built on their shafts; the third is brought into synchronism as a direct-current motor, the current necessary for this being supplied from the direct-current system.

The direct-current system of distribution was adopted for the central portion of the city, as it was considered the only one on which all kinds of service could be given from the same wires, especially if those wires were placed underground. In that section of the city a large number of motors are being frequently stopped and started. It is considered that induction motors operated under these conditions would seriously interfere with the lighting service. In sections of the city where the motors are in continuous use—for example, when

¹ Read before the National Electric Light Association at New York May 2, 21 and 25, 1899.

the right representing the discharge and lines sloping to the left the charge. The horizontal dotted line represents the total full-load capacity of the direct-current machinery installed on November 23d. The unshaded area represents the direct-current load carried directly by the rotary transformers.

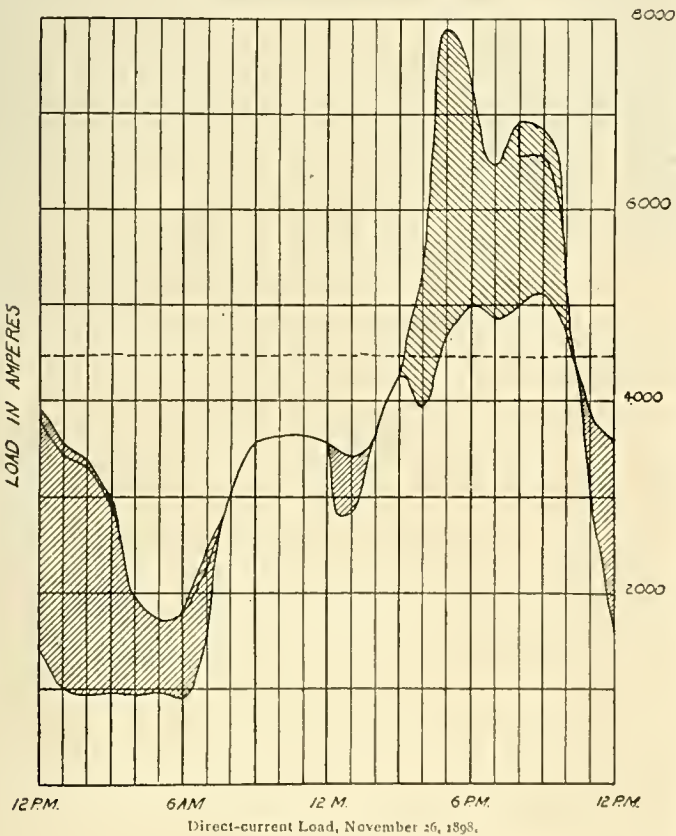
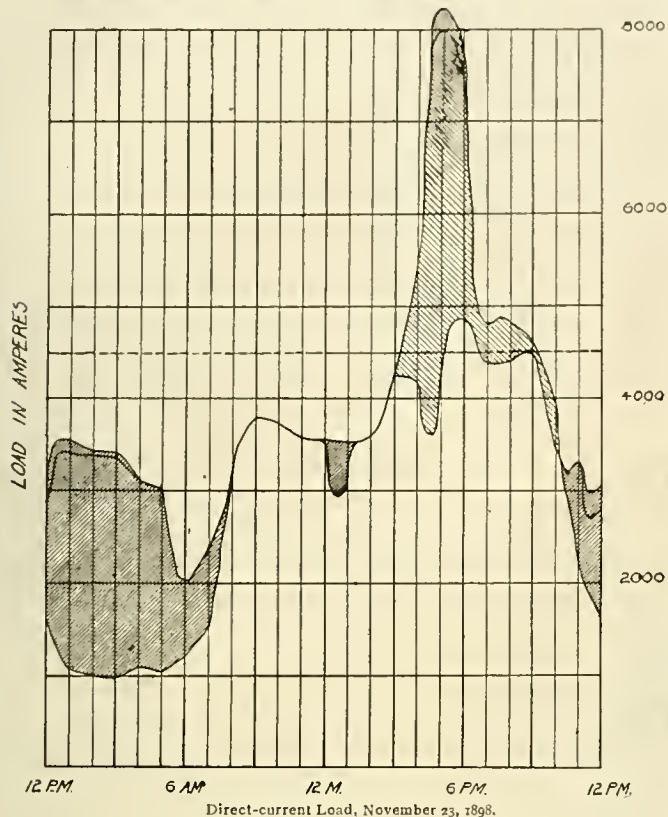
An inspection of the charts representing the direct-current system shows that the average load on the rotaries during the 24 hours was over 80 per cent. of their rated full-load capacity. The maxi-

battery system to the Hartford company have been very great. With the battery the company has been able to use a great quantity of water power that would otherwise have gone to waste. What would otherwise have been waste water power has been utilized at the peak of the load at the time when power is most valuable. The total output of the water power during the past year was over 90 per cent. of the possible output. When operating by steam, the engines have been run at an economical

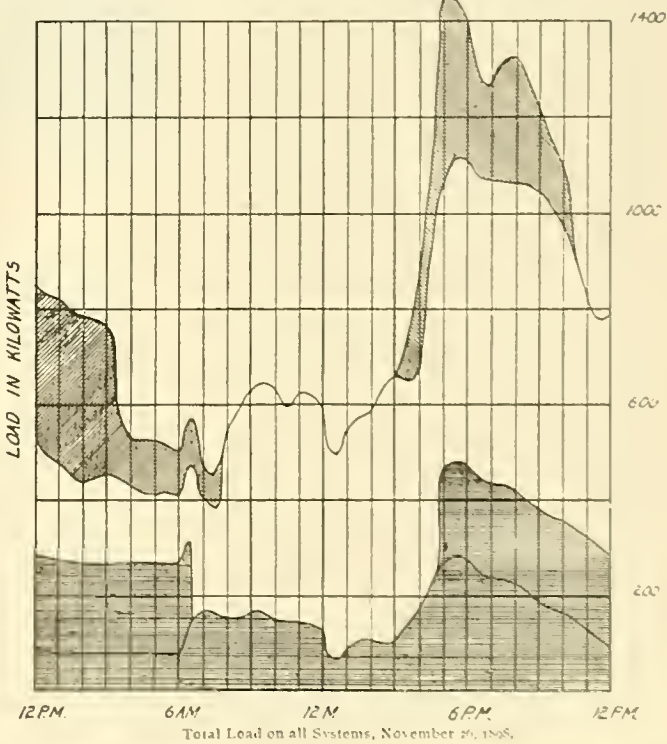
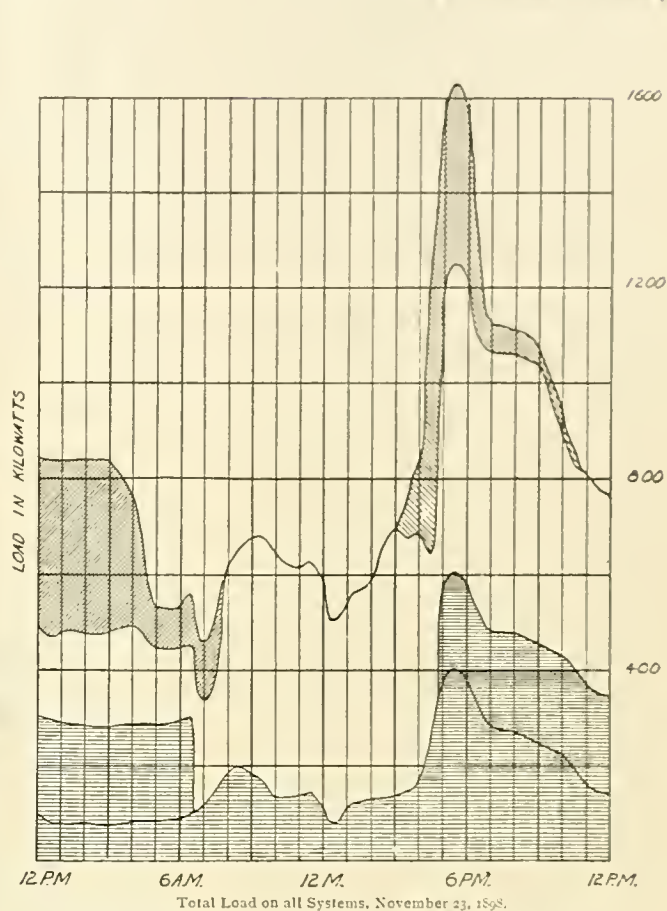
has frequently been allowed to feed the battery system through the rotaries.

The transformer and battery station is operated by three men—the superintendent, an assistant and the care of battery and two of the rotaries. The labor in caring for the station is a minimum.

The system could, of course, be operated by direct-current generators connected to alternating-current motors. This would necessitate a large



ROTARY TRANSFORMERS AND STORAGE BATTERIES AS RELATED TO LONG-DISTANCE TRANSMISSION



imum load on the system was 83 per cent. more than the full-load capacity of the rotary transformers.

A comparison of the curves for the two days illustrates the great flexibility of the storage battery. On Wednesday it was used at the high rate of discharge for a short period. On Saturday the discharge was at a lower rate, but was continued for a much longer time.

The upper portion of the area representing battery charge and discharge represents the charge and discharge of an isolated storage battery in one of the department stores.

The advantages of the rotary transformer and

load, the advantages of the storage battery being nearly, if not quite, as great in connection with the operation of the steam plant as of the water plant.

The regulation of the system is much better with the battery than it could possibly be without it, and the service is much more reliable. The interlocking of the battery with the alternating current by means of the rotary transformers makes the battery act as a regulator on the alternating-current system as well as on the direct. During the daytime on Sundays the entire load, both direct and alternating, can be carried by the storage battery. The battery

of each 250-kilowatt transformer and 300-kilowatt motor, direct-connected to two 125-kilowatt generators, and a smaller motor direct-connected to two boosters. The result would be a much greater investment in machinery, much greater floor space occupied, greater complication and expense of operation and a lower efficiency.

To sum the matter up, my Hartford experience has convinced me that the most satisfactory method of supplying electric energy over a considerable area is from a central power station generating alternating current, the current being distributed to rotary and battery sub-station of high voltage.

the energy locally distributed on the three-wire, direct-current system.

DISCUSSION.

Mr. Ayer: I want to ask Professor Robb to explain the operation of the copper strips to the field of the rotary, to determine how the correction of "pumping" was effected. That may be old to many, but it is new to me, and I think it would be interesting to us to have a fuller explanation of it.

Professor Robb: I am rather under obligations to say nothing about that. The engineer who put in the rotaries particularly asked me not to go into that subject. By that means, however, we do away with any change in the magnetization of the field magnets. Any tendency to do that is to dampen immediately, so that there is no pumping produced. You do not get the first swing in the pendulum. It is checked at the outset.

Mr. Ferguson: I would ask Mr. Robb if he is able to obtain independent regulation on each side of the system, using two, three and four rotaries with the storage battery?

Professor Robb: You mean on that method of taking the neutral from the alternating system?

Mr. Ferguson: Yes, sir.

Professor Robb: We are fortunately so situated in having all our three-wire system recently installed, that the system is very nearly perfectly balanced as regards feeders at full load, and, of course, that neutral is absolutely midway in our practice between the two outside wires. At full load our system is so balanced that we do not need it. At times of low load we need the variation in voltage on the two systems, and accomplish that by varying the losses, simply pulling out feeders on one side of the system until we balance the voltage at our junction boxes. There are ways, as you know, by means of one very small unit, by which we are able to boost one side to meet the conditions which are found in the larger Edison plants.

Mr. Edgar: I think it is rather difficult for any of us to discuss intelligently Professor Robb's paper, because I think he is the only one in the country who has had just that sort of experience. Some of the members present have undoubtedly had a large experience with all currents, and some of us have had considerable experience with storage batteries, but I doubt if any of us has carried the combination as far as he has. He has done what we have been thinking of doing for the last two years, but I did not realize that he had carried the matter as far as he has. We have the same sort of a case, only approaching it from the other side. We have five or six large storage batteries, some of which are located so far from our three-wire generating station that it is rather difficult to charge them, and we have been discussing seriously during the last year the installation of an alternator for that purpose only. Our idea is to take up the easy end of it first and transmit high-tension current to the various battery sub-stations, and then, by means of rotary converters, turn it into continuous current. The question of how to generate or how to obtain that high tension has been discussed quite fully. It seems to resolve itself into putting in alternating dynamos, run by engines, or dynamos generating both alternating and continuous current, as Professor Robb is doing, or taking the three-wire system in our large stations and transforming it by means of rotaries into high-tension, and by static transformers raising it and carrying it over the city. We have been somewhat unsettled as to the possibility of doing it commercially—the idea of rotary transformers operating in one direction with quite a high range of voltage, and then at times being compelled to operate in the opposite direction with a high range of voltage. We have been in doubt as to whether it could be accomplished practically, and for that reason I am particularly impressed with what Professor Robb has been doing.

Mr. Ayer: I think Professor Robb has been doing something else, which is a great advance in electric lighting, and which will be of great value to the central stations in smaller cities. For a good many years we have been talking about series alternating lamps, and have had various statements about them, but no one has found them satisfactory until recently. It appears that they have been operating them on a very extensive scale, something like 600 or 700 lights, using the enclosed arc. They have solved the problem, it seems to me, and have lifted a lot of troubles from the central-station managers. It lets them get away from the direct-current machine and use the alternators; and taking the alternating-current stations, where they have them installed, and are compelled to hang on to small units, they have now the opportunity of getting out. I think it would be interesting to many of the members here, who may know of it, but who never saw the system in practical operation, to have Professor Robb say something about his experience in detail in operating series enclosed arcs on the alternating system.

Professor Robb: Before I start in to answer that question I should like to say a few words more about the third rotary transformer, which I did not bring out very well in my paper. That transformer differs from the other in the fact that its shaft is continued out beyond the bearings, so that we can bring it to one of the engines and use it for direct-current generating current machines. During the

time when we were still operating series direct-current arc lamps we took from that machine every evening 150 kilowatts of direct current and ran the series arc machines from the shaft from which that was shifted by the rotary transformer, the machine acting at the same time as a synchronous motor of 250 kilowatts. There are times when it is more advantageous to take the current from that motor than the other. The way in which we have operated our series arc lamps in streets is by Brush and Excelsior machines belted to the line shafting, which is directly connected to one large 600-kilowatt synchronous motor. Operating under these conditions, it was necessary for us to supply to the synchronous motor 550 watts of alternating current for every nominal 1,200 candle power lamp operated. A year ago last month we installed as a trial the first 30-light constant-current transformer which the General Electric company built for operating enclosed alternating series lights. That proved so satisfactory, and tested out so thoroughly, and the lights ran so steadily, that during the summer we placed an order for six 100-light transformers. These have been installed, and at the present time are all running. Operating under these conditions, we supply directly to each lamp 400 watts of alternating current. In that way we save 150 watts on every lamp. The lamps have been in continuous operation since they were installed, and work with perfect satisfaction. We operate these transformers from sub-stations. We get a piece of land in an out-of-the-way place, behind some house or factory, and build a house 10 feet square and put in a 200-light transformer. No one goes near the transformers but once from the time they are started until they are stopped. The inspector of that district turns the lights on and off, and is supposed to visit the house once during the night. We have a Bristol recording ammeter for each sub-station.



G. SACCO ALBANESE.

When the inspector starts it he connects the ammeter on to one of the transformers, and when he makes his inspection he transfers it, and the swinging of the needle tells us when he went there. The line on the recording ammeter is absolutely uniform, and there is not a hair's variation between the $6\frac{1}{4}$ amperes on which we run, from night to morning. The transformers are practically automatic; they are made of two stationary coils and two movable coils balanced on knife edges. All the motion is the slight motion in the knife edge when the transformer is started and stopped; it hardly varies during the night.

Mr. Wagner: I believe Mr. Ayer made a remark that to his knowledge there had been no satisfactory installation of series alternating-current arc lamps, except probably this installation in Hartford. Mr. Ayer evidently has not been West during the last two years, or he might have seen such a plant in St. Louis. We have had for nearly two years and a half from 2,300 to 2,600 series alternating arc lamps in constant operation, which have been perfectly satisfactory in every respect to the city authorities and the citizens. The lamps are operated by transformers placed in the sub-stations. The system is not as absolutely automatic in its regulation as that which Professor Robb is using, but for the entire station output, composed of the arc lamps, incandescent lamps and power, we have only one switchboard attendant on watch, and he is not kept very busy.

Mr. Doherty: Theoretically, we could not get the same photometric value on alternating-current arc lamps as on series arc lamps, especially so on the two-phase system. I am in favor of any system which may be used with small units. I would ask if any photometric measurements have been made to determine the relative efficiency of these two methods?

Professor Robb: Mr. Ryan of the General Electric company has made many tests on that subject and published them in a paper.

G. Sacco Albanese.

The young electrical engineer whose portrait is given herewith, Mr. G. Sacco Albanese, has recently been honored by the French government with the decoration of an officer of the Academy of Arts and Sciences. This decoration is known as the purple ribbon, and is said to be esteemed by Frenchmen as next to the well-known red ribbon of the Legion of Honor. Mr. Albanese is not a native of France, but much of his electrical work, particularly the construction of electric railways, was performed in that country or in French possessions. His work has been so well done that it has attracted the favorable attention of the government.

Mr. Albanese was born on the island of Malta, but is quite a citizen of the world and speaks six languages. His electrical training was obtained in the United States, and he is proud of it and also of his membership in the American Institute of Electrical Engineers, as may be judged by the badge so prominently displayed on the necktie in the picture, which was taken in Algiers.

The beginning of Mr. Albanese's practical electrical work was at Mr. Edison's laboratory in Orange, N. J. Afterward the young Maltese became connected with the Thomson-Houston company, working in the shops at Lynn and doing outside work. He has had wide experience in construction work. After a trip to Venezuela, Mr. Albanese returned to the United States, and at the World's Columbian Exposition in Chicago he was connected with the electrical engineering staff as an inspector.

In 1895 Mr. Albanese entered the service of the Compagnie Française Thomson-Houston in Paris. The company intrusted to him the construction of the street-railway lines of Rouen (the historical town of Jeanne d'Arc) and also those of Algiers (the first tramway system in French Africa). Mr. Albanese is at present superintending the equipping of the important plant at Nice, the fashionable winter resort on the Riviera. Mr. Albanese has gained an excellent reputation among French engineers for his executive ability. He hopes to be able, before long, to pay a visit to the United States, where he left many friends.

Electroplating Hulls of Vessels.

The advantages of copperplating for the submerged portions of hulls of vessels subjected to the action of salt water are well known. Where the hulls are of iron or steel, it has been the custom, to obtain the anti-fouling benefits of the copper, to incase the hulls in wood which is in turn sheathed with copper. But, although this plan has been quite extensively used, the sea-water is apt to find its way into the space filled with wood and set up electrolytic action between the copper and iron, damaging the hull. Apparently, it would be a great advantage to apply the copper directly to the iron, by electroplating, and a New York company, the National Ship Copper Plating company, has devised the interesting process for doing this which is illustrated by the accompanying cuts, which are reproduced from the Iron Age.

An ocean tug was electroplated with copper about four years ago, and when carefully examined last November, after continuous service in salt water, the surface of the copper was in excellent condition, with no evidence of galvanic action. In some places the copper was somewhat reduced in thickness, but in no place was the iron unprotected. An intimate union existed between the two metals.

The new system provides a method of handling the electroplating baths in contact with the vessel by atmospheric pressure. Fig. 1 shows the plan outline of a vessel (A), at one end of which is located a boiler and engine (B), and near by a dynamo (C), an exhaust or vacuum pump (D), a drain tank (E), a solution reservoir (F) and a pump (G). The dynamo and pumps are connected with the engine to perform the required work, and the pump (G), which is located by the side of the reservoir, is connected with it by a feed pipe. The other side of the pump has a drain pipe (H), Figs. 2 and 3, which extends around the vessel, and is brought to the reservoir, where it terminates in the base of a standpipe. The upper end of this standpipe has an overflow pipe, through which it discharges back into the reservoir.

The pipe (H) is located on the floor of the dock and has at intervals short nipples provided with cocks and means for connecting a union (I), Fig. 4. This pipe (H) is designed to supply the electrolytic solution to the bath through the flexible tube (K), Fig. 2, the latter having a union at its upper end which connects it to the bath through the medium of a nipple, secured in the side wall of the bath. Near the lower end of this flexible tube (K) is a short branch connection provided with a cock, and a union for attaching it to the nipples along the line of the pipe (N). This pipe (N) branches out from the solution reservoir (F), so that when the bath (K) is filled with the solution and it is desired to withdraw the same, cock (J) is closed and cock (M) is opened, and the liquid in the bath will then pass down through the branch tube and back to the reservoir through the pipe (N).

As it is an important matter to keep the metallic saturation of the solution constant in the bath, and

equable in all of the baths at the same time, and, further, that the entire surface of the vessel's hull which is in process of treatment within the area of the bath should have a uniform exposure or contact of this solution, it is necessary to cause an upward movement of the solution through the bath, such movement being opposite to the gravitating tendency of the saturated solution, and instead of having the solution enter at one point below and escape through a single pipe above, means are provided as shown in Figs. 2 and 4. In Fig. 3, near the base, within the bath, a horizontal pipe is connected centrally with the inlet nipple (J). This pipe is closed at both ends and has on its upper side a line of small orifices, through which the solution enters the bath and passes up through the nipple (I) and down through a flexible tube to the drain pipe (N).

It will be seen that the pump (G) forces the solution from the reservoir, through the line pipe (H) to the flexible tube (K) thence into the bath, and overflows from the pipe (N) back into the reservoir, thereby keeping a constant movement of

The United States Government's Magnetic Observations.

By JAMES E. PRICE.

When a comet is seen blazing in the heavens, making night awesome to the superstitious and bringing pleasure to the scientific mind, public attention turns to the astronomical observatory, in order to learn all that is possible of the interesting visitor. But when a great ship goes down to destruction because the compass needle failed to keep its proper position, few people find any connection between this disaster and an observatory. Yet there is such connection, and a very important one, when the needle's deflection is caused by terrestrial magnetism, which is nearly always brought about by this trouble. And this fact is most interestingly attested in five observatories owned by Uncle Sam, and devoted to the study of magnetism. These scientific outfits are established at San Antonio, Texas, Los Angeles, Cal., Key West, Fla., Madison, Wis., and near Washington, D. C. One will also be placed at Honolulu, Hawaii.

disturbance in connection with the "epoch of elongation," that is the contraction or expansion of the needle in a certain direction. These epochs cover periods of a great many years each, varying, of course, according to geographical position and force of magnetic influence.

As far back as 1660, a record shows that at that time, in the neighborhood of New York City, the compass needle was nearly stationary, pointing about 67 1/2 degrees west of north. From this position it began moving toward the east, and after an epoch of 124 years, the declination showed but 4 1/2 degrees west declination. This epoch terminated in 1784, since which date the needle's motion has been toward the west, the present value being about nine degrees.

It is said by experts in this science that (in the United States and south of latitude 49) to make a complete oscillation of the compass needle—winging once forward and once backward in an arc of several degrees—requires from 250 to 350 years, but that there is no record of a "cycle" of this nature completed.

Another peculiarity of the magnetic current is that it exerts its influence in the deepest water as well as near or on land, flowing from the great magnet, earth, and up through the heavy body of the ocean as easily as it permeates the atmosphere. From all its dry surface and water-covered portions our planet is continually throwing off this subtle force, which is sometimes exhibited to such an extent that the consequent disturbance is called "magnetic storms."

The latter are liable to occur at any time, and are frequently manifest simultaneously in various quarters of the globe; they are often accompanied by strong manifestations of electric earth currents and a display of auroral lights. During the disturbance the magnetic needle is much affected, and at the same time sun spots are very apt to be seen; in fact, magnetic storms seem to have a great deal to do with sun spots, being often coincident with the 11-year period of the latter. Some of these storms are very intense, as that of November, 1882, when Lieutenant Greely, while at Lady Franklin Bay, observed the range of needle declination to be about 20° 28'.

The fact that there is value in the study of terrestrial magnetism is at once apparent, but its application to purposes other than those mentioned has not been practically demonstrated. However, it has been said that the Weather Bureau experts at Washington have been for some time desirous of using magnetic data gathered at the United States observatory at that place, in making weather forecasts. But discoveries in the magnetic field have not yet advanced far enough (if they ever do) to be of service in this direction.

Uncle Sam's magnetic observatory in the District of Columbia is a most interesting place to all who care for natural phenomena and scientific progress. The building which contains the apparatus used in this work is situated not far from the splendid equipment of the new Naval Observatory, upon a high level plateau overlooking the capital. From an architectural point of view the magnetic observatory building amounts to but little, for it is quite a small structure, unornamented and built of wood. But it has a characteristic attachment. This is a high mound of earth situated just at the back of the house, having its top perforated by ventilating pipes, which lead down into an underground room, in which the magnetic investigating outfit is kept. This room has double walls with intervening air spaces, and is heated by small gas stoves, which keep the temperature of the place constant.

The apparatus consists principally of an automatic recorder, operated by means of clockwork machinery and three magnetic needles. The latter are mounted on stone pillar supports, arranged north, west and east, and are enclosed in glass-covered cylinders. Opening into each of these is a narrow wooden-boxed channel, about six feet long, which extends to the corresponding side of a wooden case that contains the recording mechanism, the work of which is to keep in motion a sheet of sensitized photographic paper. The needles are so nicely balanced that the least magnetic wave makes them vibrate, and every motion is reflected by a small mirror placed behind each of the three. By this, with the aid of a spot of light, centered on each of the reflectors, the position of each needle is continually thrown through the boxed channel and upon the moving sensitized paper, which makes a photographic record. The paper is taken from the recorder every two days and put through a developing process. If there has been magnetic disturbance the sheets will contain irregular lines, corresponding to the force and direction of the magnetic impulses. But if the needles have remained fixed at any time during the two days' period, straight lines will appear, showing the absence of magnetic waves at that particular instant. The magnetic record thus obtained is reproduced upon blue-prints, copies of which are sent to observatories in this country and Europe.

For some of the information herein contained I am indebted to Mr. C. A. Schott of the Coast and Geodetic Survey, who not long ago was awarded the Wilde prize by the French Academy of Sciences for his discoveries in terrestrial magnetism.

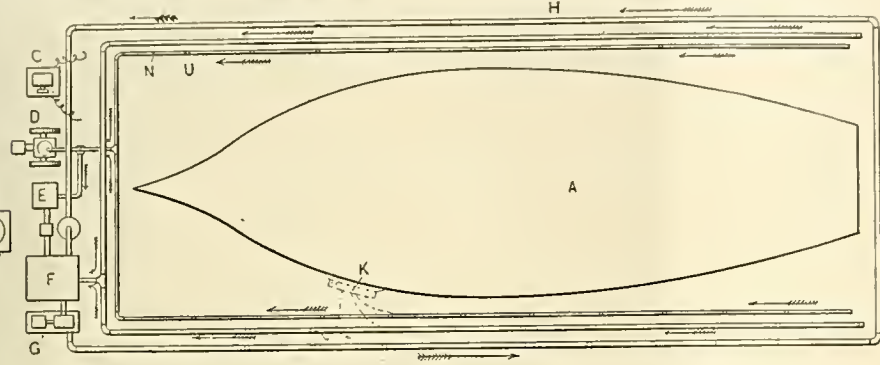


Fig. 1. Plan.

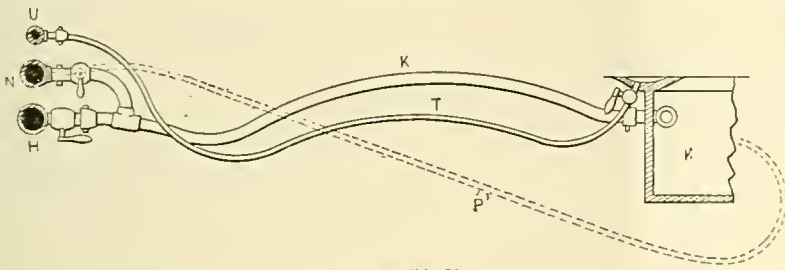


Fig. 2. Flexible Pipe.

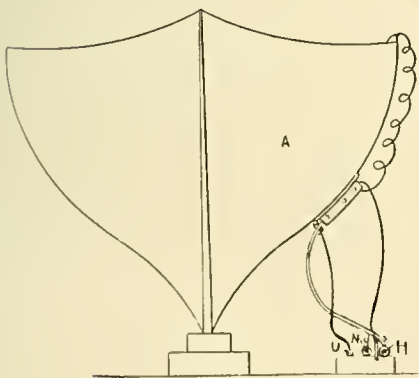


Fig. 3. End of Vessel with Bath in Position.

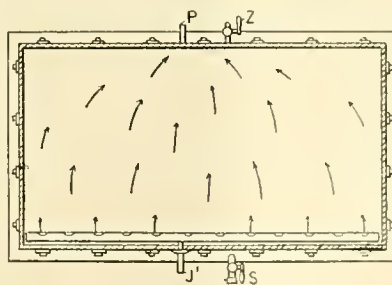


Fig. 4. Side View of Bath.

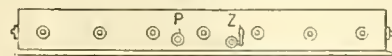


Fig. 5. End View of Bath.

ELECTROPLATING HULLS OF VESSELS.

the solution through the bath. As the capacity of the pump should be greater than is required by all the combined baths in the series, the residue travels around the supply pipe (H) and is forced up into the standpipe, which by its height determines the pressure of the solution in the various baths.

Each bath has anode holders placed at intervals along its side walls, and as they are equidistant from the side of the vessel when the bath is in position, however much the bath may be curved (to conform to the curvature of the vessel), the electro-deposition will be uniform on the cathode. Otherwise, the electrolytic action would be greater over the zone where the anode approached close to the cathode surface.

The bath has a concave flexible web. A flexible tube leads to the air pipe (U), which is provided with nipples at suitable intervals. This pipe is connected with the vacuum pump (D). This pump is constantly in action, so that as air is exhausted from the bath atmospheric pressure holds it in position.

It is evident that with this method the plates of a vessel may be copper coated after bending and before insertion in the ship. Rivet heads and exposed edges may be copperplated after completion of the ship. In fact, the plan provides for electroplating any part of the vessel at any time and to any required thickness.

The study of terrestrial magnetism has been going on for many years, and some valuable data concerning it have been gathered—information which has been applied practically for the benefit of the mariner, the miner and the land surveyor; but in all cases the observations have had much to do with the compass, the needle of which at times becomes exceedingly erratic. These changes are closely watched at the various magnetic observatories and notes made of the different positions of the needle, the time of occurrence and the force and direction of the magnetic current. The facts are tabulated, published by the United States Coast and Geodetic Survey, and distributed so that any navigator, by consulting his magnetic chart, can tell just what the extent of compass variation there should be in a given latitude; and not only can he obtain up-to-date information in this particular, but, if so desired, he can tell the extent of needle variation which occurred more than a hundred years ago, or can look years into the future and get accurate data in the same line. In fact, the government's experts in this work make their reports to cover periods far ahead of current time, as, for instance, in the 1807 report, which is entitled "Distribution of the Magnetic Dip and Magnetic Intensity in the United States for the Epoch January 1, 1900."

One of the most striking features in magnetic



EVERY SATURDAY.

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CONTENTS OF THIS NUMBER.

Table listing contents of the issue with page numbers, including Electric Transfer Table, Chicago Union Traction Company, Rotary Transformers and Storage Batteries, etc.

DEPARTMENTS.

Table listing departmental contents with page numbers, including Correspondence, Electric Lighting, Electric Railways, etc.

CONVENTIONS AND EXPOSITIONS.

Table listing various international and national electrical exhibitions and conventions, such as the International Electrical Exposition in Commemoration of Volta, etc.

Once more the British project for a Pacific cable is reopened, this time by the imperial government. There has been so much dissatisfaction manifested throughout the colonial possessions over the terms proposed heretofore that it was questionable whether the scheme could be successfully put through on that basis.

Chicago newspapers are indulging in wild speculation regarding the introduction of an automatic-telephone service in this city in opposition to the Bell system. The possibility of the successful accomplishment of such a project is so remote that one would not be surprised to find the Bell interests encouraging the idea, hoping thereby to postpone indefinitely, if not, indeed, to kill effectually, all serious opposition to its plant in this city.

In view of the increasing trade between this country and Japan great interest will attach to the announcement that patent protection will be granted foreign inventors in the land of the mikado on the same terms as natives. Heretofore, there has been no way to protect foreign patents in Japan, and that empire is filled with machines made by the Japanese in imitation of the best American and European patents.

Elsewhere in this issue the details of the plans for the annual meeting of the Independent Telephone association are presented. The organization has again favored Chicago by selecting this city as the place of meeting, and the manufacturers and dealers located here have shown their appreciation by preparing an elaborate plan of entertainment for visitors, which will culminate in a banquet at the Auditorium Hotel as the closing feature of the meeting.

The association seems to have awakened to a realization of its position and its purpose, and the officers exhibit a commendable desire to make the organization something beyond a pretext for an annual wrangle. At the present time the spirit of harmony prevails, and there appears to be a real, live interest in the industry.

of the Independent Telephone association, and that henceforth it will prove a powerful factor in the telephone world.

The plan of this year's meeting will be entirely different from all former gatherings. There will be public sessions, at which topics of interest to telephone men and to the public will be discussed. There will be many features to attract exchange managers, and a large representation of this important element is expected.

The maneuvers at the torpedo station at Newport do not possess the same interest for the public this year as formerly, but they will doubtless be carefully followed by naval experts. The officers of the North Atlantic squadron have been invited to go on board the torpedo boats for personal observation.

The torpedo boat was the bogie of the Spanish-American war. Before actual hostilities were commenced and while the public was engaged in comparing the relative strength of the respective navies, much apprehension was expressed on account of the superiority of the Spanish torpedo equipment over that of this country.

Fortunately, experience showed that these fears were groundless. The torpedo boat was not an appreciable factor in the war. At Manila one attempt was made by torpedo boats to destroy the Olympia, but the machine guns played such havoc that it was abandoned. Again, at Santiago, two torpedo boats accompanied Cervera in his famous dash, but they were completely riddled and sunk before they could get within striking distance of the American fleet.

Electrical Uses of Aluminum.

Aluminum is attracting attention as a commercial possibility in the transmission of electricity abroad as well as at home. Mr. Ernest Kilburn Scott has an article in a recent issue of the London Electrical Review, pointing out what he considers some practical electrical applications of the light metal. The essential part of Mr. Scott's article is given:

Owing to its greater sectional area for a given current, it is as a bare conductor that aluminum shows to best advantage, when compared with copper. There are many cases where it could be used, as, for example, the bus-bars of large switchboards, either to fasten directly on the slate or be supported behind the board by projections from the cast-iron standards. The increased sectional area gives larger contact surface for connection bolts, cable eyes, etc.

Connections between Accumulator Switches and the Regulating Cells.—This is always a very heavy item, but especially so where the generating station is badly planned and the switchboard a long way from the regulating cells.

Switch Arms.—Heavy currents and long breaks necessitate switch levers of 18 inches, or even more, in length, and these, if made of a copper alloy or gun-metal, bring considerable stress to bear on the slate or marble on which they may be mounted. Obviously, with a light-weight switch arm a more sudden break can be allowed.

Power-transmission Lines.—Many of the long-distance transmission schemes abroad are for mines, etc., situated in most inaccessible places, and therefore, on account of the considerable saving in the weight, there seems to be an opening for the use of bare aluminum wire, and incidentally, also, there would be a slight saving in insulators.

Removable Telephone and Telegraphic Lines.—The reduction in weight is a specially valuable feature for field military purposes, as the size of the conductor for such work is fixed at a certain minimum size for mechanical reasons. The saving in weight over copper is therefore practically as 3.3 is to 1.

Portable Testing Instruments.—Some of the portable testing sets, ammeters, ohmmeters, etc., at present on the market are exceedingly heavy, and although there are comparatively few users of such apparatus, according to Mr. Scott, makers would undoubtedly find it pay to use the lighter metal more freely.

Brush-holders.—Aluminum-alloy castings have been used for brush-holders because of the variation of pressure (due to gravity) between the brushes on the top side and those on the under side of a commutator. The lighter castings reduce this variation, while, at the same time, the total weight on the brush rocker is considerably reduced in large machines.

Pure aluminum has a specific conductivity of 67 per cent. of that of pure copper. With one-half per cent. of impurity the conductivity is reduced to 61 per cent., while with one per cent. impurity the conductivity is 59 per cent. It is when we compare the castings made in the two metals that aluminum shows to best advantage, for, although both must be alloyed with other metals to give sound castings, the reduction in conductivity on this account is relatively greater with copper than with aluminum. Good nickel-aluminum castings can be made having a conductivity of 45 to 50 per cent. of that of rolled copper, but it is very seldom that ordinary copper-alloy castings such as are used every day for switch work and similar purposes exceed this figure. There is little difference in the tensile strengths.

For some time there was a difficulty in getting good aluminum-alloy castings, but this has now practically disappeared, owing to brass foundries and others having learnt by experience the peculiarities of the metal. Soldering and brazing, although they can be performed, are still drawbacks when compared with copper, but there is this to be considered, that for most of the purposes enumerated above mechanical joints may be used; in fact, for some purposes they are preferred.

Niagara Falls Power Company.

The Niagara Falls Power company has elected as directors Edward D. Adams, John Jacob Astor, George S. Bowdoin, Charles F. Clarke, Charles Lanier, Joseph Laroque, D. O. Mills, William B. Rankine, Francis Lynde Stetson, F. W. Whitridge and Edward A. Wickes. The board of directors organized by electing these officers: President, D. O. Mills; first vice-president, Edward A. Wickes; second vice-president and treasurer, William B. Rankine; secretary, F. L. Lovelace; assistant secretary and treasurer, W. Paxton Little; executive committee, Edward D. Adams, Francis Lynde Stetson, D. O. Mills, Charles Lanier, F. W. Whitridge. The directors of the power company have been directors of the Cataract Construction company, which, having completed its contracts with the power company, goes out of business. In their new positions they take the places of the old board of directors of the Niagara Falls Power company. Among those who retire are General Benjamin Flagler, Hon. W. Cary Ely, Charles A. Sweet, L. W. Pettibone, Hon. Peter A. Porter, E. S. Wheeler, W. S. Humbert, Coleman Sellers and Arthur Master. Future affairs of the Niagara Falls Power company will be directed from Niagara Falls, at which point Second Vice-president William B. Rankine will make his home.

What Jersey Lightning Can Do.

Lightning played some queer freak at the farmhouse of Garrett Baird, in Somerset County, N. J., last month. The house is in Hillsborough township, some two miles east of Harlingen, the nearest railway station. It is a substantial two-story structure, and was occupied by Baird's father before him. The exact time of the stroke was 10:31 a. m. on May 23d; the stopping of the clock at that moment shows this. It was a prankish bolt, for while it did all sorts of odd things with the house and its fittings and furnishings, it harmed no person.

Mrs. Baird was standing on a chair in the dining room whitewashing the wall at the time, says the New York Tribune. A colored boy of twelve was on the covered porch in the rear of the house, while Baird and a hired man were in the barn, some 200 feet away. The lightning descended first on a pine tree near the house, and several feet higher than the peak of the roof. It left the tree after traveling a short distance, leaped over to the gutter of the house and tore out the corner post completely, leaving the rooms on both floors exposed to view. Thence it darted in various directions, visiting every room in the place except that on the ground floor used by the Bairds for a sleeping apartment. Mortar was torn from the ceilings everywhere and pictures and ornaments were knocked down.

Mrs. Baird was stunned by the experience, but suffered no bodily injury. The room was filled with flames and, so it seemed to her, with sulphurous fumes. Her first idea was that her clothing was on fire, but, feeling her dress, she found this was not so. She was so frightened that she screamed. Just then the darkey boy rushed in, crying:

"Oh, Mrs. Baird, are you killed? I am!"

"But he wasn't. He had been on the porch cleaning a mahogany stand. The lightning had torn it from his grasp and hurled it 15 feet away. The top was split, but the boy, in spite of his statement to the contrary, was not killed. He wasn't even hurt, but he was the worst-scared darkey in the state.

After a gay journey through the cellar, and feeling that it had had all the fun it wanted in the house, the bolt skipped over the ground for a visit to the barn. The work "skip" is accurately used, for several holes were made in the line of flight. A pet cat was killed here, but a lot of turkeys near by were not harmed. The lightning struck the barn near the top and shattered several rafters.

When Baird heard his wife's screams he rushed to her assistance, but found there was nothing to be done for her. The house was on fire in the upper part, however, but after a little delay the flames were put out. In the dining room a window-sash had been broken, and most of the pictures were knocked down. A framed motto had escaped the pious bolt. This read, "God Bless Our Home." The ruin in the house was picturesque. One leg had been wrenched from the sewing machine. The glass panels of the front door and the iron grating covering them had been knocked out. The lock of this door had been utterly shattered, and bits of it lay all over the hall. A hanging lamp was broken. In the kitchen the pump was torn apart and the iron sink cracked. The clock was stopped, but, beyond its shattered glass, was apparently not injured. In the cellar cans of preserved vegetables and fruit were strewn on the floor. Emerging here, the lightning tore away a brick from the window.

Opportunity for Water-power Development in the South.

[From The Tradesman.]

The great natural water power at the Falls of Yadkin River, North Carolina, is to be utilized for the generation of electricity. The electric energy will be used to operate a great cotton mill. The river is forced through a narrow channel of not more than 75 feet wide, the stream above the narrows being 1,000 feet wide. The fall through the short and narrow gorge is about 40 feet. The company said to have undertaken to develop this power claims to have a capital of \$5,000,000, and proposes to distribute electric power over a radius of 50 miles around Yadkin Falls. The whole of the eastern slope of the Blue Ridge, known as the Piedmont region, from Middle Virginia through the Carolinas and well into Georgia, is dotted with fine water powers that can be cheaply developed. Properly harnessed, they would produce enough electric current to turn the world's machinery. Projects looking to the operation of railways by electricity generated by water power, through that region, for hauling granite and marble from the quarries, moving other freights and carrying passengers, are being seriously discussed by men who have the money and credit required, and why not? The lighting and operation of electric railroads in Sacramento is by electricity, generated by a waterfall 30 miles distant, and two cities in the state of Oregon are soon to be furnished light and power in the same way.

What can be done at Niagara and on the Pacific slope can be done in and by the South, that has millions of horse power tumbling down the streams that run from her mountain slopes. Harness the torrents; make them answer instead of coal and steam enginery. Switzerland has been, for 10 years or more, making use of the waters that issue from

the Alps to create electric current for operating textile mill, hardware, ironing, wood-working machinery and railway, and the time must be close at hand when the same thing will be done in the South where the streams are never seriously frozen by ice, and where, being fed by springs, their volume is remarkably uniform. All the running of street railroads, all the water pumping and lighting to supply southern cities, will in time be the work of electrical energy, produced by water.

Must Furnish Protection for Children.

"Walters against the Denver Consolidated Electric Light company" is the title of two cases that were recently considered together in the Court of Appeals of Colorado. Both had been dismissed because it was held that the complaints did not state causes of action.

One of the complaints set forth the business of the electric-light company; that it had extended its wires to the house of the plaintiff's father, for the purpose of supplying light to that house; that it had attached to the house, near to and directly under the window, a converter, and near to and above the converter, and directly under the window, had placed two iron supports to hold glass insulators, to which were attached wires, connecting with the house, and conveying the electric current for furnishing light to the house; that the company had carelessly suffered the wires to become uncovered and uninsulated; that the plaintiff, a child 12 years of age, who was residing with his father, upon looking out of the window, and seeing that one of the insulators had been removed from its iron support, and knowing nothing of the danger incident to his coming in contact with the wires attached to the insulator, seized the insulator for the purpose of replacing it upon its support, and received a charge of electricity from the naked wire which his hands touched, resulting in serious and permanent injury to him.

The objections to this complaint were: First, that the facts alleged did not constitute negligence on the part of the defendant company, within the contemplation of the law; second, that the complaint showed that the proximate cause of the injury was the act of the plaintiff in seizing the insulator, and not the exposed condition of the wire; and, third, that it appeared upon the face of the complaint that the plaintiff was guilty of negligence contributing to the injury.

But all of these contentions the Court of Appeals sweeps aside. It says that it may concede that at places where there is no apparent possibility of injury ensuing from electric wires it would not be negligence to leave them uncovered, and that no duty to keep them insulated would exist, unless it was imposed by some express law. Nevertheless, the accident in question was one liable, and which the company must have known was liable, to happen at any dwelling to which electric appliances were similarly affixed, and in which there were children or persons ignorant of the purpose of the appliances or the nature of the electric fluid; and the court declares that it cannot say, as a matter of law, that proof would not be admissible, under the averments of the complaint, which would justify a verdict that in leaving the wire exposed as alleged the defendant was guilty of negligence. And if such proof would be admissible, the court holds, then the complaint, in so far as the charge of negligence was concerned, was sufficient.

As to the "proximate cause" of the injury, the court thinks that counsel fell into some confusion respecting the legal meaning of the term, and holds that the question of the legal effect of the boy's act in reaching out to the wire was in no manner connected with the question of proximate cause, and could be considered only in an examination of the charge of contributory negligence.

Nor does the court consider that from the statements of the complaint it could be said, as a matter of law, that the plaintiff was guilty of contributory negligence, as it might very naturally occur to him to replace what he saw out of place and to restore order where he found disorder, without apprehending danger.

Finally, referring to the other case decided with this, brought by the boy's mother, the court holds that negligence could not be imputed to her for taking hold of the boy while he was still in contact with the wire, so strong being the instinct of a mother.

On these grounds the court reverses the judgments in both cases.

Chicago Edison Improvements.

The annual meeting of the stockholders of the Chicago Edison company was held on June 12th and action was taken authorizing the issue of \$1,000,000 additional capital stock, making the total \$2,000,000. About \$500,000 of the stock will be issued at present, going at par pro rata to present holders. The money will be used to extend the underground system of the company in anticipation of much greater demands for electric power in the immediate future. The directors were re-elected as follows: Edward L. Brewster, F. S. Gorton, Samuel Insull, Joseph Leiter, R. T. Lane, J. J. Mitchell, Frank M. Phelps, A. F. Secherber, Byron L. Smith, A. A. Sprague and Lambert Tree.

DEVELOPMENT OF THE TELEPHONE FIELD.

Independent Telephone Association.

The annual meeting of the Independent Telephone association will be held at Chicago on June 26th, 27th and 28th. In many respects this gathering will be different from former conventions, as the principal part of the proceedings will be open to the public, and a programme of interesting papers upon subjects of special interest has been prepared. In order that visiting exchange managers may have an opportunity to examine new apparatus without neglecting the meetings it has been decided to set aside sufficient time to permit a careful examination of exhibits at the hotel or a visit to any of the local factories. Delegates will also be entertained by the Chicago manufacturers and supply men at a banquet and a tally-ho party and steamboat ride.

The arrangements for the meeting were completed last week, when President Thomas and Messrs. Critchfield, Dougherty and Fisher of the advisory board met representatives of the telephone manufacturing and supply houses at Chicago. Two days were occupied in completing arrangements, and several conferences were held with local representatives.

The Auditorium was selected as the headquarters of the association, and arrangements were made for holding the meeting in the large banquet hall. The smoking room of the hotel was also secured for exhibition purposes, so that out-of-town manufacturers may have ample opportunity to display their specialties. It was also decided to hold the banquet at the Auditorium. It is believed that this arrangement will prove convenient to the members and will insure a large attendance at the meetings of the association.

The Chicago manufacturers and supply men have arranged for the entertainment of the delegates during their visit, and the advisory board has approved of the plan. This includes a tally-ho ride on Wednesday afternoon, at the close of the convention. The party will leave the Auditorium at three o'clock and ride north on Michigan avenue to Monroe street, west on Monroe to La Salle, south on La Salle to Jackson boulevard and east on Jackson to Michigan, thence south through the boulevards and parks, returning by boat to the Auditorium, where the banquet will be served at 8 p. m. This will be a complimentary dinner to the association by the independent telephone interests of Chicago, and will be a fitting termination for what, it is hoped, will prove the most successful meeting that has yet been held.

The committee also secured a concession from the Auditorium Hotel management in the form of a reduction of 25 per cent. from regular rates for members of the association.

The passenger associations will give the usual rate of one and one-third fare from all points in the United States.

The programme for the convention and the entertainment features, as approved by the advisory board, follows:

MONDAY, JUNE 26TH.

The executive committee and the advisory board will meet at 8 p. m., in the parlor of the Auditorium Annex, to settle all business matters of the closing year, and to formulate reports of officers and committees.

TUESDAY, JUNE 27TH

The first session of the convention will be held in the banquet hall of the Auditorium Hotel at 10 a. m., and will be opened by the president, Judge James M. Thomas, who will deliver the annual address. Reports of the officers and committees will then be submitted.

This will be followed by introductions and a short social session at which new members will be received.

At 2 p. m. another session will be held, the programme of which is as follows:

Paper, by S. P. Sheerin of Indianapolis, president of the New Long-distance Telephone company of Indiana. Subject: "Value of Long-distance Toll Lines." Discussion.

Paper by C. L. Boyce, manager of the Citizens' Telephone company of Grand Rapids, Mich. Subject: "Operation and Maintenance." Discussion.

Paper by Maxime Reber, electrical engineer of the Cuyahoga Telephone company of Cleveland, Ohio. Subject: "Essentials of Telephone Construction." Discussion.

Paper by Hon. H. D. Critchfield, counsel for the United States Telephone company of Ohio. Subject: "Development of the Independent Telephone Business." Discussion.

After this session delegates and visitors will enjoy themselves in social session, and have an opportunity to meet their friends and visit points of interest in the city.

WEDNESDAY, JUNE 28TH.

The entire morning will be devoted to the inspection of exhibits; no formal session will be held. Visitors who wish to examine the local factories will be afforded an opportunity of doing so at this time.

At 1 p. m. visitors will assemble at the Auditorium, where tallies and coaches will be provided to take them through the city and the South Side parks and boulevards. At Jackson Park a steamer will be waiting to convey the party back to the city, af-

fording a delightful view of the city from the lake.

At 8 p. m. the banquet tendered by the Chicago manufacturers and supply men to the association will be given at the Auditorium Hotel. This will be the principal social feature of the meeting. The banquet hall will be appropriately decorated, and excellent music will be provided.

All persons connected in any way with the independent telephone interests are invited to attend the convention and enjoy the pleasures afforded by the tally-ho ride, the steamboat excursion and the banquet. Application for banquet tickets must be in the hands of the advisory board not later than Tuesday, June 27th, at 1 p. m. The programme of toasts and responses will be announced later.

The advisory board expects that there will be at least 500 telephone men in attendance, and the influence of such a gathering upon the public is expected to be very great.

Patent Decision Against Bell Interests.

A patent decision at Washington, D. C., on June 1st, which is of vital interest to the independent telephone companies, disposed of an interference suit covering strong and sneak-current protectors, brought against F. R. McBerty, an inventor and expert of the Western Electric company, by Frank B. Cook of the Sterling Electric company. The real defendant of this case, however, is the American Bell Telephone company. The case has been contested for two years. The Bell company evidently considered it of great importance, as Mr. H. A. Seymour, one of the ablest patent attorneys in Washington, was retained to assist the regular attorneys in the defense. These efforts were unavailing, however, as the decision was given in favor of Cook for the third time. The Bell company is using thousands of these protectors which infringe Mr. Cook's patents. On the other hand, Mr. Cook and the Sterling Electric company have made thousands of the same protectors for both Bell and independent telephone companies, their output being over 40,000 during the last three months.

The patents involved in this decision cover the principles contained in the manufacture of the well-known strong and sneak-current protector of the Sterling Electric company. The protectors are used upon cable terminals at the central office and individually at the subscriber's station.

Chicago Telephone Company's Improvements.

[From the Chicago Record.]

After the present fiscal year it is understood that the Chicago Telephone company will leave the 12 per cent. dividend class and go to a 10 per cent. basis. The action of the directors in ordering an enlargement of the capitalization to the full authorized limit—\$5,000,000—and their determination to submit a proposition that the limit be raised to \$15,000,000 are said to presage the prosecutions of such improvements and extensions of the service and plant as will put the company in the position of a model for the world. The company's management is said to have now mapped out work which will require about \$6,000,000 to carry out. The amount of stock at present outstanding is \$4,336,560, and the treasurer has been instructed to issue 6,635 shares at par pro rata to stockholders of record May 31st. The new stock must be paid for before June 24th, and the certificates will be issued July 1st. The company is hampered in its improvement work by the difficulty experienced in securing the delivery of supplies for which contracts have been made. The company has several new exchange buildings under construction, and everything is being done to provide for the operation of, say, 50,000 instruments. The company is contemplating the introduction of an optional measured-rate system, and has it under test at the present time. This system is designed to equalize charges and to make the service available for many thousands of persons who at the present time are without it. The measured rate, it is explained, will in no case make the annual cost greater than the present maximum, but in a great majority of cases it will result in a reduction of the cost to the subscriber. The plans on which the management is now at work contemplate 22 exchanges in Chicago, whenever the demands of the city require so large an equipment. The reduction of the dividend rate, it is said, is merely thought of as a natural adjustment under the new capitalization. If the stockholders vote for the increase of the capital stock to \$15,000,000, it is announced that the certificates will be issued only in such amounts and at such times as the needs of the company may dictate, and then to present holders at par pro rata.

"What Might Have Been."

[From the Rochester Post Express.]

Professor Alexander Graham Bell tried again and again to persuade Don Cameron to buy for \$10,000 one-third interest in his telephone inventions. Cameron thought Bell a half-witted dreamer, refused to put up a dollar, and even went so far as to give orders that the crazy inventor, as he called him, should no longer be admitted to his office. That one-third in the invention is to-day worth not less than \$20,000,000.

Carty Bridging-bell Patent Upheld by Court of Appeals.

By a decision of the United States Circuit Court of Appeals for the Third Circuit, handed down in Philadelphia last week, the validity of the Carty bridging-bell telephone patent seems to have been finally established. The fact is one of considerable importance to all manufacturing and operating telephone companies, as a wide use is made of bridging systems. The patent—No. 449,106—was issued on March 31, 1891, to John J. Carty, and was assigned to the Western Electric company of Chicago. It was entitled "Telephone Circuit and Apparatus," but is more generally known as the Carty bridging-bell patent. On November 4, 1896, the Western Electric company brought suit in the United States Circuit Court for the Western District of Pennsylvania against the Millheim Electric Telephone company of Williamsport, Pa., for infringement of this patent. The case was argued in February, 1898, by George P. Barton for the plaintiff and the late Stanley S. Stout, acting for the Western Telephone Construction company of Chicago, which sold the apparatus complained of, for the defendant. The experts for the owner of the patent were C. D. Haskins, F. R. McBerty and Mr. Carty, the inventor. For the defense Kempster B. Miller testified as an expert. The case was tried before Judge Buffington at Pittsburg, and in July, 1898, a decision was rendered in favor of the complainant, upholding the patent. From this decision the Millheim company, supported by the Western Telephone Construction company, appealed to the United States Circuit Court of Appeals. On appeal the case was argued in March last in Philadelphia by Mr. Barton, for the appellee, and Josiah McRoberts for the appellants, Mr. Stout having died on June 18, 1898. The jurists who constituted the Court of Appeals were Judges Acheson, Dallas and Kirkpatrick, the last-named writing the opinion of the court. The decision was handed down on Thursday of last week and affirmed the decision of the court below, upholding the patent. The opinion is as follows:

"The respondents herein, the complainants below, filed their bill of complaint alleging infringement of letters patent No. 449,106, granted March 31, 1891, to John J. Carty, and by several assignments duly transferred to the complainants. The defenses set up in the answer were lack of novelty and patentability, prior publication and non-infringement. An examination of the record shows that prior to the Carty invention much difficulty had been experienced in communicating telephonically between different stations on a many-party line. The difficulty was increased with the number of stations and their distance from each other.

"This was due, in part, to the fact that the stations were as entireties connected on a series system, so that the call generator, the bell ringer and the voice currents had each to pass in series through each instrument, whereby the energy of the current was dissipated before reaching the distant station, and in part, because the lines were electrically unbalanced and subject to serious internal inductive disturbances, as well as from neighboring wires and currents.

"To obviate these difficulties Carty discontinued the practice of including the call-sending generator and the call-bell magnets and the telephone serially in the same circuit when calling, and substituted the connection of the said appliances in parallel bridges.

"The bell-magnet bridge was equipped with a magnet having a high coefficient of self-induction, and was normally and permanently closed at all stations. The generator bridge circuit was normally open, but adapted to be closed when sending a call. The connection of the telephone in a third bridge circuit at each station was normally open, but capable of being closed in multiple with its own bell-magnet circuit and the bell-magnet circuits of all the other stations when in use.

"The practical result was that when the call-bell generator was closed and put in connection with the main-line circuit, the low-frequency current of the call bell short-circuited through the bell magnets, and the bells were rung at all stations, including the home station. The call-bell generator circuit was then opened and disconnected. The telephone circuits between the two stations desiring to communicate were then closed and thereby put in multiple with each other and the call-bell magnet circuit. But while the telephone circuits were so in multiple with the bell-magnet circuits, yet the high-impedance magnets in the bell-magnet circuits rendered these last-named circuits opaque to the high-frequency voice currents of the telephone and enabled them to be transmitted undiminished over their own low-impedance circuit to the receiver with which they were in connection.

"By this combination of devices Carty obtained the effect of two distinct and separate circuits, one of which was adapted to the low-frequency currents of the bell generator and the other to the high-frequency voice currents of the telephone. It also had the effect of electrically balancing the lines, and thereby reducing to a minimum the annoyances of induction, which had so seriously interfered with the usefulness of the old system.

"So far as the record shows, there was no anti-

patron of this device. All the elements of the combination had been used before and the functions of each were well known in the art, but it does not appear that they had ever been similarly specifically combined for effectuating the purpose here accomplished. The grant of the patent carries with it the presumption of patentability, and this presumption has been strengthened by the general acceptance of the device, the acquiescence of those skilled in the art and their willingness to accept licenses thereunder.

"We have carefully considered the questions of prior publication and anticipation. The differences between the patent in suit and those cited as most nearly approaching the Carty device have been fully and particularly set out in the opinion of the learned judge below. [The opinion of Judge Buffington in this case was printed in the Western Electrician of July 30, 1898.]

"We fully concur in his conclusions and refrain from drawing the distinctions, lest we should but repeat what he has so clearly expressed.

"Infringement is charged in the bill and not denied, except in the unverified answer. Complainant's witness, after examination of defendant's system, testified that it was constructed and organized completely in accordance with the instructions contained in the patent in suit. Though these facts were peculiarly within their own knowledge, the defendants offered no contradictory evidence bearing on the question.

"We are of opinion that the patent is valid and infringed. The decree of the Circuit Court will be affirmed."

Improved Service in Ottawa.

[From the Ottawa, Ont., correspondent of the Western Electrician.]

The Bell Telephone company has completed arrangements for installing a new plant in Ottawa, which will give the capital of the Dominion a service as complete and up-to-date as any city in the world. The whole city has been rewired, and the subscribers will get a new instrument, designed on a different principle from those in use at present. The most elaborate and costly part of the equipment will be the new switchboard to be put in the central office. The improved system of this new board will also greatly facilitate the work of the operator. Instead of having to watch for the falling of the shutter connected with each subscriber's line, and instead of bells sounding, the board will be equipped with colored electric lights, which will change when "central" is wanted. The removal of the telephone from the hook automatically lights the particular lamp belonging to the subscriber's line; the operator makes the connection with the station asked for, and when the party called removes his ear-telephone from the hook, the lamp upon his line is also lighted. When both lamps go out, the operator knows that the conversation is ended. The whole system will be in operation soon, and it will entail an expenditure of \$750,000.

Michigan Movement.

[Special correspondence of the Western Electrician.]

Detroit, June 8.—The strike of the linemen of the Detroit Telephone company is to be settled by arbitration, the arbiters being H. T. Snider for the strikers, Alex. I. McLeod for the company, and Edward S. Lee as the third member. An early settlement of these long-standing differences is looked for.

An effort is now making in the state Legislature to bring the telephone and street-railway companies under the proposed Fleischauer taxation bill. Representative Moore said: "The Detroit street-railway system is worth \$17,000,000, and yet is paying only \$20,000 a year taxes, while the Michigan Central is worth \$30,000,000 and pays \$200,000. Now, that is unjust, and we ought to bring the Detroit street-railway system into this bill."

The Pingree men in the Legislature now in session are going to bring out a rival bill to the Graham measure for the taxation of telephones. It provides for a two per cent. specific tax on gross earnings on all telephone companies. It does not leave local exchanges to local taxation, as under the Graham bill. An effort will be made, it is asserted, to have the rate increased to three per cent. of the gross receipts. The effort will be continued from now until the fate of the bill is settled. J. H. G.

NEW COMPANIES.

The New York Suburban Telephone company has been incorporated at Albany, with a capital of \$10,000, and the privilege of increasing it to \$100,000. The general routes and points to be connected are as follows: Through the counties of Westchester, Putnam, Dutchess and Rockland, connecting the cities of Yonkers, Mount Vernon, New Rochelle, White Plains, Tarrytown, Poughkeepsie, Nyack, Port Chester, Rye and the various boroughs and villages thereof. The term of the company's existence is to be 30 years. The directors are Albert Devau, William Caxton and Charles Auth of New York, Henry A. Mott of Rye, James P. Powers of Elizabeth, George E. Archer of Mount Vernon and Hiram O. Hance of Plainfield.

Telephone News from the Northwest.

[From the Minneapolis correspondent of the Western Electrician.]

The Minnesota Telephone company of Rush City, Minn., is preparing to extend a line to Princeton, Minn., 40 miles, at once.

The town of Humboldt, Ia., has granted franchises for telephone exchanges to the Electric Light and Power company, the Iowa Telephone company and to Messrs. Chase, Prouty and others.

The Iowa Telephone company of Ottumwa, Ia., announces reduced rates, which the Ottumwa Telephone company declares are too small to pay expenses.

The Clearfield and Mount Ayr Telephone company has completed connection with Alton, Ia.

The Ottumwa (Ia.) Long-distance Telephone company contemplates building a toll line to West Point, Ia.

The Cedar Valley Telephone company has been granted a franchise at Iowa Falls, Ia., and will build at once, putting in a local exchange, and it will also connect with Williams, Ia., to meet the Martin Telephone company.

The Wolf River Telephone company has about completed its line from Omro, Wis., to Ripon.

Enough subscriptions have been secured at Mountain Lake, Minn., to justify putting in a telephone exchange.

The Badger State Telephone company of Janesville, Wis., has let the contract to Jones & Winter of St. Paul to construct 100 miles of line.

The Standard Telephone company will build a line to Riceford, Minn., from Mabel, and back to Spring Grove.

The Automatic Telephone company of Salina, Kan., contemplates putting in an exchange at Walthalla, N. D.

The Western Electric Telephone company is rebuilding its line between Clear Lake and Britt, Ia.

The Northwestern Telephone Exchange company sought an injunction at Northfield, Minn., to prevent the Northfield Telephone company from stringing wires immediately under those of the former. A compromise has been proposed, and will probably be accepted.

The new telephone interests which recently secured the control of the Wisconsin Telephone company are said to have made an offer to the Dane County Telephone company of Madison, Wis., one of the strongest independent companies in the state.

The Wood County Telephone company of Centralia, Wis., will shortly be clear of debt, and the stockholders are now discussing whether it is best to reduce rates or to invest the earnings in extensions.

The Mankato (Minn.) Citizens' Telephone company has voluntarily advanced wages of its employees.

The People's Telephone company of Chatfield, Minn., has added a 40-drop switchboard and instituted all-night service.

The Northwestern Telephone Exchange company proposes to erect a building of its own at Grand Forks, N. D., for its exchange, in addition to rebuilding its entire system.

The Iowa Telephone company will build a toll line from Humboldt to Rutland, Ia., at once.

The Hawkeye Long-distance Telephone company has completed arrangements to build a toll system to cover Fayette County, Ia., and will also arrange to give farmers connections, if desired.

Otto Wettstein will put in a telephone exchange at Belle Plaine, Ia., at once. The exchange will start with 100 connections. He will also establish an exchange at Gladbrook, Ia.

Dr. W. W. Bradley of Forman, N. D., has begun rebuilding his telephone system. He will put in metallic circuits to every point.

The Northwestern Telephone Exchange company is working to induce the Minneapolis druggists to put in nickel-in-the-slot instruments, but the druggists have refused, fearing a loss of trade if they do.

The Northwestern Telephone Exchange company is preparing to build to Armour, S. D.

The Supreme Court of Minnesota has handed down a decision in the case of the Northwestern Telephone Exchange company against the Chicago, Milwaukee and St. Paul Railway company, declaring that the privileges of telephone companies, under federal statutes, may not be exercised over railroad property, unless vitally necessary. The telephone company sought to secure a right-of-way for its poles along the railroad right-of-way.

The Mutual Telephone company of Des Moines, Ia., will expend \$20,000 in improvements. The cables will be repaired and improved and changes made. The company will also establish a sub-exchange in East Des Moines.

The Winona Telephone company of Winona, Minn., is contemplating the erection of a new brick building for a central office and headquarters.

The Fort Dodge (Ia.) Telephone company has arranged for toll connection with Tara, Ia.

There are nearly 200 instruments connected with the telephone exchange in Brainerd, Minn., and the number is increasing steadily.

PERSONAL.

E. B. Overshiner of Longansport, Ind., was a Chicago visitor last week.

H. A. Brinkerhoff of Upper Sandusky, Ohio, has

succeeded Mr. George L. Johnson as manager of the La Crosse Telephone company of La Crosse, Wis.

Telephone Etiquette.

Mr. Angus S. Hubbard, the general manager of the Chicago Telephone company, advises patrons to observe the same rules of behavior in conducting transactions of a business as well as a social character by telephone as they would follow in personal intercourse.

"The great increase in the number of telephone users makes this a matter of far more importance to the business public than is generally realized," he says. "The telephone is an instrument for the saving of time in the transaction of business. Used with the same good sense and judgment that is applied to any other method of facilitating business or social intercourse, it answers that purpose admirably, but when abused or handled rudely it is distorted into an irritation and a cause of offense."

If the following suggestions were followed by the public, Mr. Hubbard said, the efficiency of the telephone service would be practically doubled:

1. If you wish to telephone anyone, make the call yourself and remain with the telephone at your ear until answered by the person called, or until you find out that he cannot be reached.
2. In answering a call give the name of your firm or office. This immediately identifies you and the calling party proceeds with conversation. The immediate answer, "This is Jones & Co. What do you want?" saves a great deal of time.
3. Do not ask anyone to "hold the wire," if you know you are to be away from the instrument more than a minute or two.
4. When your bell rings answer your telephone just as quickly as possible. The person calling you is waiting at the other end of the line, and both your time and his are busy to all callers when they are connected.
5. Do not talk to the telephone with "a chip on your shoulder" and address the operator in a tone of voice that never think of using to speaking to any of your own employees. Be courteous.

Wolf River Lines.

The People's Telephone company has been purchased by the Little Wolf River Telephone company of Weyauwega, Wis., which acquired possession on June 1st. The proposed lines will be built as planned by the People's Telephone company. The poles of the Little Wolf River Telephone company are already set as far as Waupun via Ripon, from Omro and Berlin. Ripon has already been connected up, and Waupun will be connected in a few days.

The line between Fond du Lac and Oshkosh has already been commenced, and the work on the exchange in Fond du Lac will be completed in July. The line from Clintonville to Shawano, which will connect with the Northeastern Telephone company, is about two-thirds completed, and this connection will be made in about two weeks. The poles are all set and the company will in a few days begin stringing wire for Ogdensburg and Big Falls. Poles are on the ground for Iola and Scandinavia.

MANUFACTURERS AND DEALERS.

The Edison Manufacturing company of New York calls the attention of telephone subscribers to its electric fans, which are fully described in a booklet which will be mailed to anyone sending name and address.

Probably the most remarkable shipment of telephones since the inauguration of the independent telephone business in opposition to the Bell company is reported by the Western Telephone Construction company of Chicago. Upon Saturday, June 3d, that company shipped seven complete telephone-exchange equipments, including switchboards, telephones and appurtenances, each of 100 drops capacity. For one day's business this is indeed a remarkable record. The Western company reports its May shipments as the largest in the history of the concern.

Everything is bustle and activity in the offices and factory of the Eureka Electric company of Chicago. Secretary and Treasurer Arthur Stein states that the demand for the Eureka apparatus has been greatly in excess of all expectations, and that the company is obliged to work its forces day and night in order to keep up with its orders. The Eureka company, through the energetic efforts of Messrs. Kusel and Stein, has been able to secure its full share of telephone business, and the favor with which its apparatus is being received will tend to keep it in the front rank of the telephone business.

The Western Telephone Construction company of Chicago has issued a circular, from which the following is an extract: "The recent decision by the United States Circuit Court of Appeals in Philadelphia, affirming and sustaining the Carty patent will undoubtedly result in an extensive series of lawsuits against telephone companies by the Bell monopoly. The Carty patent covers all forms of telephones permanently bridged in the line, that is to say, where two or more telephones are in use. This involves serious consequences to long distance and toll line telephone users. We desire now to positively assure our customers of our ability to prevent interference with the use of the Western Express No. 2 bridged type of telephone. These telephones have proved their superiority over everything else in the market." The Western company offers to change the spring bridging type of telephones to a positively non-infringing type of telephone. The telephone will be guaranteed to ring one more telephone on the line than it would previous to making the change.

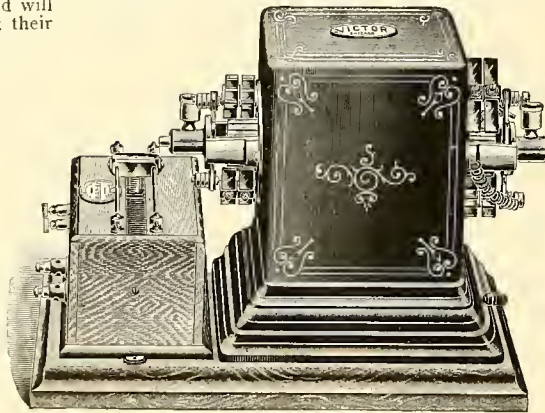
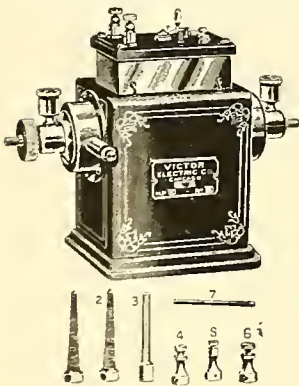
Colonel Shay's New Connection.

J. H. Shay of Chicago, familiarly styled "Colonel Shay" by his friends in the electrical and street-railway field, has accepted a position with the Chicago Belting company, and will devote his attention particularly to the introduction of that company's product among the electric plants of the country. Colonel Shay has been selling belts all his life, and has established a reputation as an authority upon



J. H. SHAY.

the subject of belting. Moreover, in addition to his exceptional ability as a salesman and his acknowledged standing as an expert upon belting, he has won recognition by his reliability and strict observance of every requirement of his customers. He was connected with the Munson Belting company of Chicago for 16 years, and handled all that concern's large deals during that period. His old friends in the electrical and street-railway field will welcome him in his new capacity and extend their

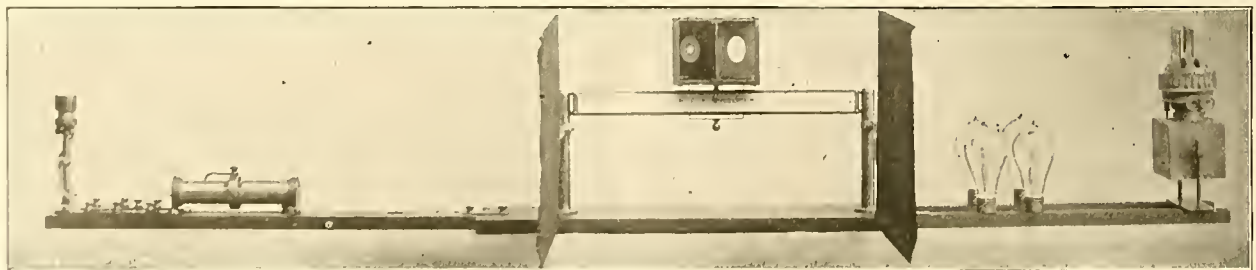


FIGS. 1 AND 2. VICTOR MOTOR APPLICATIONS.

congratulations to the Chicago Belting company for securing such an able and efficient representative.

Portable Photometer for Central Stations and Lamp Salesmen.

Now that lamp buyers have become too critical to accept any incandescent lamp as having the candle power, voltage and efficiency marked on its



PORTABLE PHOTOMETER FOR CENTRAL STATIONS AND LAMP SALESMEN.

and the need of a means of testing is imperative. The photometer illustrated is put on the market by the Electric Motor and Equipment company, Newark, N. J., successor to the Newark Ornamental Iron and Steel Works, the well-known makers of electrically illuminated signs. It is a knock-down instrument five feet in length when extended, and capable of being packed into a space 24 inches long, 12 inches wide and nine inches high, and is made up in two styles, one for central-station use and the

other for salesmen, the former being somewhat stronger and the latter lighter.

The working standard of light is a duplex oil lamp, which is calibrated by the simple use of a primary standard placed in the socket in which the lamps are tested. These primary standards are special lamps made by the General Electric Lamp Works, seasoned and of low efficiency, and hence undergo very slow changes. By using one of these for a moment or two the oil lamp can be adjusted to the proper brilliancy, at which it will run for hours without readjustment.

The spot box is of the regular Bunsen grease-spot type, with inclined mirrors and working over a celluloid scale. A small german-silver resistance coil provides suitable means for adjusting the voltage over a range of about 15 per cent. Owing to the fact that the influence of extraneous light is more or less balanced out by the calibration of the working standard against the primary standard, placed in the position which the lamps to be tested subsequently occupy, no specially prepared dark room is necessary. The weight of the portable instrument is reduced to 12 pounds, complete, in a canvas carrying case.

It should be noted that the manufacturer has recently added to this simple equipment a special attachment for rotating the standard lamp and also the lamp which is being measured. This attachment is a valuable improvement.

Victor Motor Applications.

The accompanying illustrations show two of the specialties manufactured by the Victor Electric company of Chicago. Fig. 1 represents a small electric lathe. It is of one-sixth horse power and is provided with a set of seven mandrels, each of which can be attached directly to the armature shaft, one end of the shaft having a right-hand thread and the opposite end a left-hand thread. The motor is entirely encased in metal and is dust-proof. Its speed is under perfect control. It is finely finished in enamel and nickel. These machines have been sold extensively to jewelers, dentists and others who have light polishing, drilling and grinding to do. They are guaranteed against electrical and mechanical defects for two years.

The rotary transformer shown (Fig. 2) generates 60 amperes at six volts. The company makes

smaller transformers; in fact, it is prepared to furnish them of almost any capacity up to one horse power for 110 volts or 220 volts primary circuit. The greatest care is used to maintain perfect insulation between the two windings. The machines are provided with both speed and current regulators. Besides acting as transformers, they can be used for power purposes. With the exception of the commutators and brushes they are entirely iron-

clad. They are wound for slow speed and run with but very little noise. The machine is mounted on an oak base, finely finished, the transformer itself being finished in enamel and nickel.

The Bluestone Electric Light and Water company of Branawell, W. Va., has gone out of business, having sold its plant to the Pocahontas Light and Water company of Pocahontas, Va.

A. W. Knutson.

Mechanical genius is often found among those who have been reared upon farms without any facilities for developing their natural gifts. Sometimes when opportunity offers they develop their ability and acquire distinction as inventors and in the commercial world, as in the case of the subject of this sketch, A. W. Knutson, who was born at Dayton, Webster County, Iowa, on August 22, 1866. He passed his early years in the rural districts, working upon a farm until he was 17 years old. He then turned his attention to mechanical pursuits, for which he had always shown an inclination, and secured valuable experience in the service of the Interstate Elevated Rapid Transit Railway company of Kansas City and in manufacturing establishments of that city. Returning to his old home, he soon secured an opening at Galesburg, Ill., in the local electric-lighting plant, where he became familiar with electric-lighting apparatus and had considerable experience in repairing lamps. It was during this time that he conceived the idea of the Knutson gravity clutch, which has been described and illustrated in the Western Electrician. These clutches have given Mr. Knutson deserved prominence among the electrical men of his section. He is now manager of the firm of



A. W. KNUTSON.

A. W. Knutson & Co. of Galesburg, Ill., which manufactures these devices, and is building up a nice business.

Important Wisconsin Electric Railway Project.

The Geneva, Sycamore and Morris Railroad company proposes to build an electric railroad beginning at Geneva Lake, Wis., and passing south through McHenry and DeKalb counties, cutting across the northeast corner of La Salle and the southwest corner of Kendall counties, and ending at Morris, Grundy County. The route thus describes a wide curve, making an outer belt line varying in distance from Chicago from 50 to 65 miles. The road will be of standard gauge, with 85-pound steel rails. The main power house will be built at Sycamore, but there will be other power houses on the line. The president of the road is James Brenan of Sycamore. George Brown of Sycamore is treasurer of the company and ex-Mayor White of Sandwich is general manager. The chief

engineer is Major Gambel of Elgin. It is planned to do a passenger, express, mail and freight business on this road. The line will cross nine steam railroads, and it is the intention to provide switch tracks connecting with all of them and to transfer freight cars from one railroad to another.

The village of Princeton, Minn., voted to establish an electric-light and water system at a cost of \$16,000.

Electrical Protection of Safes and Vaults.

By CLYDE J. COLEMAN.

The title of this paper assumes that all people are not honest and implies the necessity for guarding against surreptitious entrance. No one questions the right of the proprietor to protection against theft.

I will first aim to justify the need for a thoroughly effective safeguard by a slight research in criminology. There is one instance on record where a steel-lined bank vault was entered from the top by first ascertaining the thickness of the steel with a very small drill, leaving a hole too small to be discernible from the inside, and then using a large drill provided with a gauge, so as to drill all but through the lining, and with this a series of holes was drilled embracing a section of sufficient size to admit a person when the section was removed. This method admitted of work being done each night over quite a period of time, as the drill, held from going clear through, did not show any marks from the vault interior, and still cut the metal so effectively that all that was necessary was to pound it down with a heavy sledge in order to gain access to the vault. In another instance, where entrance was gained to a vault from the top, and after the vault had been plundered a wedge was so placed that the lock and bolt work on the door could not be operated from the outside, in the morning the cashier, failing to open the vault, telegraphed for an expert, who worked for three or four days drilling before he succeeded in opening and discovered what had been done and that the vault had been robbed. This delay allowed the burglars sufficient time to successfully escape.

The uses of nitro-glycerine and other high explosives have been so successful as to show the folly of trying to make something so strong that it cannot be broken. The latest danger to the banker is the electric current. While it involves a certain amount of engineering on the part of the burglar, the conditions existing, especially in large cities, are such that it is a comparatively easy matter to provide sufficient power to effect an entrance to any vault, as it will accomplish what explosives cannot, owing to the environments in the larger cities making such a method extremely risky, while the electric arc can be used quietly, quickly, and employed so as to show no light. Where current from incandescent or power circuits cannot be obtained, storage batteries are by no means out of the question, as they can, for a case of this kind, be discharged far above their rated capacity, besides being made especially light for the occasion, as they need be used but once, and all the usual considerations of local action and long life do not have to be considered. The use of the electric arc does not require the amount of intelligence so often displayed in constructing an ingenious set of burglar's tools, and as to weight these tools often weigh over 500 pounds. An interesting thing is that no insulating material interposed between vault plates seems to make any difference with the arc, as it has been found by experiment that asbestos, concrete, etc., burn as readily as any metal, which is due no doubt to their fusing and becoming electrolytic conductors.

The present secretary of the United States Treasury, after investigating the subject of burning and the use of storage batteries, said he considered it entirely feasible for a burglar to rent a room adjacent to a bank and carry in as many batteries as he liked at his leisure, and offered the argument that if discovered they would not be evidence of criminal intent, as would burglar's tools. The future possibilities of new dangers are almost unlimited. It would be interesting to know what might be done with liquid air by pouring a couple of gallons on top of a safe and cooling the steel to a point where it could be easily broken with a sudden blow from a heavy hammer. Liquid oxygen might be used to burn a hole through a wall of steel by lighting a piece of sulphur and using it as a match to start the combustion of the steel and then turning in a stream of oxygen.

Now, coming directly to the subject of this paper, it might be well to divide electric protective systems broadly into open and closed-circuit systems. The open-circuit system, as its title implies, depends for its operation upon contacts or equivalent devices, closing a circuit to operate some alarm mechanism, when an unwarranted entrance is attempted. This system is little used, except in residences, and then it has proved really more of a nuisance than an advantage.

The closed-circuit system comprehends the use of a current of given strength, continuously traversing the line wire connecting the vaults or premises with the alarm station, together with contacts, circuits, linings, resistance coils, etc., and connected with a relay at the alarm station, which is so adjusted that this normal amount of current keeps the instrument balanced. Should the current be increased or decreased, which would be the case were any part of the circuit broken or short-circuited, the balance on the relay would be disturbed in such a way as to give an alarm by closing a local circuit connected with and controlling the alarm mechanism. But it has been found that a system of this kind is capable of being circumvented. By interpolating a low-resistance mil-ampere-meter in the circuit and employing two sets of variable resistances, so that

by gradually cutting in resistance on the alarm circuit and cutting out resistance across the alarm circuit, and by observing the mil-ampere-meter, so as to maintain at all times the current constant on the alarm-station end of the circuit, it is possible to finally shift the current from the protected structure to the artificial resistance, so that the circuits at the vault or guarded premises are rendered inoperative.

To overcome this difficulty and thoroughly protect the line wires (which are the most vulnerable part of an alarm system), a number of schemes have been proposed, such as having frequent predetermined signals, changes of resistance, voltage, etc., sent to the alarm station by a watchman or some automatic device. Then again, this must be so arranged as not to allow of its cycle of operations being ascertained by any outside means; it should also be capable of automatic operation at both ends; otherwise, it will involve so much constant manual attention at the alarm station as to be impractical. One very effective and simple method is to construct the line wire of a number of very fine and thinly insulated wires and braid the whole into a cable. By connecting each wire to the system the cable will present a veritable labyrinth of circuits so closely interwoven that it is physically impossible to do anything with it. Another method proposed is the use of wireless telegraphy, thereby dispensing with any wires to tamper with.

Instead of the usual alarm station, involving manual attention and consequently susceptible of collusion, a system much more practical for banks is one in which a large alarm mechanism is placed in a heavily constructed steel box, which, in turn, is electrically protected, so it cannot be tampered with, and is located in some conspicuous place on the bank premises. A system of this character must possess the advantage of being automatic in its operation and entirely under the control of the banker from the vault end.

ELECTRICAL BARRIERS.

One of the most exacting conditions relative to this branch of electrical engineering is to obtain a satisfactory protective means for the vault or guarded premises. Probably the simplest and most efficient window protection consists simply in cementing narrow tinfoil strips on the inner surface of the glass, as any breakage or fracture of the glass will suffice to open the circuit.

For guarding entrances or the walls of rooms, glass tubes filled with mercury and connected in circuit or tubes filled with water or compressed air, or, conversely, maintaining a vacuum in a partition or enclosure, have all been used, so that any disturbance from a normal condition will result in an alarm being given.

A very difficult barrier to circumvent is one in which steel wires are tensioned by a spring and adapted to a contact, so that any increase or diminution in its tension will allow a contact arm to touch a contact point located on either side of it, which is connected to the opposite side of the system, constituting practically a mechanical relay. A Frenchman proposes, by a burglar stepping on a mat, to automatically light a flashlight and open a shutter in a camera concealed in the ceiling and focused on the vault entrance, to obtain a photograph of the invaders. A rather ingenious and quite effective scheme contemplates balancing the safe on a scale platform, which is so connected to the alarm system that any weight added to or taken from it will cause an alarm. The Bank of France lowers its vaults each night in a pit filled with water, which connects with float devices, so in case it should be drained an alarm would be given.

One inventor does not propose to make any noise at all, and does not believe in letting a single burglar get away; to this end he constructs around the entrance of the vault a divided steel caging, each section of which is held open, against the pressure of a very strong spring, so arranged that any attempt to enter the vault will result in capture. Microphones have been located inside the vault and connected with a system and so adjusted that the noise attendant upon forcible entry or such as persons moving about in the interior of the vault would cause sufficient disturbance of the controlling current to actuate the alarm. It has also been proposed to connect the system with a transmitter at the alarm station, or at the banker's residence, so he may listen for any unusual noise should the alarm indicate a disturbance in the circuit.

The construction found to best fulfill all requirements in modern practice is an electrical lining covering the entire inner surface of the vault, which is constructed of a number of (tinfoil strips cemented on insulating paper and composed of several layers of such sheets, and placed between steel plates to afford mechanical protection against injury, also to render it absolutely impossible by any means to remove such mechanical armor without destroying or disturbing so delicate a condition as the linings, while at the same time there are no moving parts to get out of order or give trouble, and if substantially installed, is permanent for any length of time.

In conclusion I will say that a modern protective system should be sensitive to the conditions it is intended to guard against, while not involving such delicacy as to give trouble, and should, so far as possible, be automatic in its operations and incapable

of defeat by an expert connoisseur of electrical conditions, even to the minutest details.

The time belongs to the past when a system of fund may place all dependence upon mechanical safeguard, solely to resist physical force. They must provide such safeguard with something that will give notice of any attempt to enter, and electricity is to be found the best device for this purpose, that is the simplest and most efficient guardian.

CORRESPONDENCE.

New York Notes.

New York, June 12—Various reports about the electrical equipment of the Manhattan electric ways have been circulated but no authentic information has been given out. There is little doubt that a site for the power plant, which will be a very large one, has been selected, and it will have a water frontage. The units will be of great size. As to train equipment, it seems to be still undecided whether the Sprague multiple-unit or the older motor-car system shall be employed. Mr. Baker, the electrical superintendent, came from a road where the old plan of concentrating the motors on one car in a train is used, but the directors are said to be carefully investigating the Sprague system also. Open cars will be run in warm weather. It is reported that the Manhattan company expects to be in a position to sell surplus electricity, like the Metropolitan Street Railway Company.

The Automobile Club of America was organized at the Waldorf-Astoria last week. George F. Chamberlain was elected president and Honer W. Hedge was made secretary. The charter was signed by all of the men present, about 30 in number, and the following-named gentlemen were appointed as a committee to draft a constitution and by-laws: General George Moore Smith, Charles R. Flint, Whitney Lyon, Dr. Frank Hollister and William H. Hall. William E. Buzby was elected temporary treasurer. The object of the club is to advance in every legitimate way the interests of the owners of automobiles. A clubhouse will be opened and a stable procured where the vehicles can be properly cared for. It is thought much may be done to advance the use of the automobiles by securing more favorable legislation.

It is said that the manager of Alexander Winton's recent automobile expedition to New York, Charles Sanks of Cleveland, is in New York, with \$4,000 to cover the forfeit posted some days ago in Paris by M. Charron, the French automobilist, who issued a challenge to Winton to race over a course of 1,000 miles. Mr. Winton intends to make the Frenchman hold to his agreement. The forfeit of \$4,000 will be put up in New York, and correspondence will be at once entered into with M. Charron.

Thomas A. Edison and S. Mallory of Orange, N. J., William H. Shelmerdine, Harland Page, E. Clarence Miller, William S. Pilling, Luther S. Bent and Theron I. Crane of Philadelphia have incorporated the Edison Portland Cement company of Camden, N. J., to manufacture and deal in Portland and other cements. The authorized capital stock is \$11,000,000.

A dispatch from Trenton, N. J., states that the Liquefied Air company, with a capital of \$125,000 was incorporated on Saturday to manufacture and sell liquefied and compressed air. The capital stock is divided into \$31,250 of preferred and the remainder common stock. The preferred stock is to bear seven per cent. non-cumulative dividends. The incorporators are Charles A. Wilson, Justus Cox, Jr., and Harry B. Paul, all of Camden.

A recent review of the operations of the Brooklyn Rapid Transit company, of which Clinton I. Rossiter is president, shows that the company has brought into one system surface and elevated railways aggregating 504 miles of track. The capital stock of the company is \$45,000,000, and the funded indebtedness of the constituent companies is \$20,000,000. There are now in Brooklyn but two other independent lines—the Coney Island and Brooklyn railroad, with a mileage of 54 1/2, and the Van Brunt Street and Eric Basin railroad, a short electric line of 1.25 miles. M. S.

Northwestern Notations.

Minneapolis, June 12—A test case in Kenosha, Wis., has given H. S. Van Ingen of Kenosha \$75 damages and costs for injuries to his trees by the Chicago and Milwaukee Telegraph company.

E. H. Ford of Madison, Wis., has been engaged to furnish plans for the proposed municipal electric plant for Columbus, Wis.

C. Crickmore of Minneapolis has bought the electric-light plant at Appleton, Minn.

The Twin City Rapid Transit company has let the contract for grading the extension of the line from St. Paul to Stillwater, Minn., and expects to have cars running from St. Paul to Stillwater by July 1st, and to have the Stillwater system in operation by fall.

Feed wires of the street-railway system in Duluth, Minn., were found cut recently. Detectives were placed on the trail, and 10 men ex-employees of the company, were arrested. The arrest was made on Sunday when they were unable to get bail. A "sweat-box" investigation was put in force, the men

having no attorney to represent them. When the case came to trial they were discharged on a technicality. Warrants were issued for them again, but some escaped to Superior. The union then ordered a strike and the service was badly crippled as a result. The men declare the company arrested the men for spite, and has been using all the arbitrary and tyrannical measures possible to break up the union.

F. A. Valentine has retired from the management of the electric-light plant at Cannon Falls, Minn., and has gone to Minneapolis, where he will engage in the manufacture of electrical machinery, with his brother, Robert Valentine.

The city of Dubuque, Ia., has sued the street-railway company on assessments for street improvements for several years. The amount is \$7,579.

The Citizens' Traction company of Oshkosh, Wis., has formally accepted the franchise for an interurban line in and through Neenah, Wis., and filed a \$5,000 cash deposit. The company announces that contracts are let and materials are now on the way for the extension. The company has filed amended articles, permitting it to operate an interurban line between Oshkosh and Neenah, and increasing the capital stock from \$225,000 to \$500,000.

The United States court has ordered the transfer of the Light and Traction property in Dubuque, Ia., to the General Electric company. It has been in the hands of a receiver for several years.

The Chippewa Falls and Bloomer Electric Railway company is to be formed to build a line from Chippewa Falls, Wis., to Bloomer. The Chippewa Valley company is run by the same owners.

There is a movement on foot at Wenewoc, Wis., to put in an electric-light plant.

C. F. Loweth, civil engineer of St. Paul, is drawing plans for an electric-light system for Princeton, Minn.

The Fond du Lac (Wis.) Street Railway and Light company has purchased the plant of the Fond du Lac Electric company, the consideration being \$110,030.

There is talk at Deadwood, S. D., of constructing an electric railway to Lead, S. D., and other towns in the Hills.

The Madison (Wis.) Street Railway company will expend \$7,000 on improvements this season.

The city of East Grand Forks, Minn., will vote on establishing a municipal electric-light plant.

The council of Austin, Minn., will secure estimates of cost for an electric-lighting plant.

A new company is being formed at Lyons, Ia., to purchase the electric-light plant and put it in good condition.

The Interstate Traction company of Duluth, Minn., expects to have its line to Minnesota Point, using electric power, by June 10th. J.

PERSONAL.

W. R. Mason, the St. Louis representative of the Siemens & Halske Electric company, was in Chicago last week.

Luther Stieringer, the electrical expert, stopped in Chicago early in the week, on his way to the Pacific Coast.

J. F. Stauffer, treasurer of the George C. Towle Manufacturing company of Lancaster, Pa., has been spending several days in Chicago.

H. B. Slater, manager of the Cañon City Electric Light and Power company of Cañon City, Colo., was in Chicago early in the week. Mr. Slater contemplates increasing the capacity of his plant and is investigating apparatus for that purpose.

R. A. Willson, who was superintendent of the municipal light and power system at Marquette, Mich., for a number of years, is now filling a like position with a large private corporation in Helena, Mont. He was succeeded at Marquette by Charles Retaillic.

Marcus Nathan, manager of the Electrical Exhibition company of New York, is enjoying a western trip. He spent several days in Chicago and is now making the rounds of the Wisconsin summer resorts. He will visit California and then return to New York.

W. P. Sullivan, favorably known in electrical circles throughout the country, has been appointed sales agent for the McKenzie Furnace company of Chicago and will make his headquarters in this city. Mr. Sullivan's acquaintance and wide experience should insure his success in this venture.

B. G. Smith, manager of the Kankakee (Ill.) Electric Light company, was in Chicago early in the week. Mr. Smith says that the central-station business in Kankakee is good. The company uses water power nearly all of the year and supplies electric power to two street-railway companies.

A Berlin dispatch, dated June 6th, states that the Empress Augusta Victoria and the imperial crown prince were present on that day at the unveiling of the statue of Hermann von Helmholtz, the physicist, in front of the University of Berlin. Emperor William started the subscription for this statue with a pledge of 10,000 marks at the time of the Helmholtz funeral in 1894.

Albert Stanley, who succeeded John Grant as general manager of the Detroit street-railway lines, has been brought up in the company's service. He was originally promoted from superintendent of the Juffer Avenue line. Mr. Grant, who has resigned to accept a position as assistant general man-

ager of the Citizens' street railway of Indianapolis, was connected with Detroit railroads for many years. Mr. Grant's former duties as claim agent will now fall to Walter Ross, who has been employed for some time by the company as arbitrator. Albert Stanley saw service in the recent war as a sailor on board the Yosemite.

ELECTRIC LIGHTING.

The Brown Electric company has succeeded the Wytheville Electric Light company at Wytheville, Va.

The city of Winnipeg, Manitoba, has purchased two 100-light Western Electric arc machines and 220 Western Electric open arc lamps.

The Ennis Ice, Light and Water company's property at Ennis, Texas, was sold at auction last month for \$13,300, Fred W. Wolfe & Co. of Chicago being the purchasers. The new owners will take charge at once and continue the business in Ennis.

ELECTRIC RAILWAYS.

The White Line Traction company has been incorporated in Trenton, N. J., with a capital stock of \$4,000,000. The company's business will be the purchase and operation of street railways anywhere in New Jersey.

A serious strike among the employes of the "Big Consolidated" street-railway system of Cleveland is in progress. Very few cars are running on the lines of that system, and it is possible that the men on the "Little Consolidated" system may also strike. In the latter event the street-car service of the town would be practically at a standstill. The recognition of the street-car employes' union and higher wages are asked by the men.

Judge Marean of Brooklyn has handed down a decision in favor of the defendants in the action of Mrs. Aaron de Grauw against the Long Island Electric Railroad company and others to enjoin them from operating express cars on the street-surface railroads in Jamaica, L. I. He holds that the authority given to the railroads to "convey persons and property" comprehends the conveyance of property unaccompanied by persons. Trolley freight cars have been in operation in Brooklyn for a couple of years, but this is the first judicial decision in regard to the legal right to use them.

The Collins Park and Belt Railroad company of Atlanta has applied for electric-railway franchises to cover every portion of that city. Ten routes are scheduled in the application, which has been filed with the city clerk. It is said that the company is prepared to spend \$2,000,000 in these extensions and improvements. J. C. Simmons is president of the company, and H. M. Atkinson, the well-known electrical man of Georgia, is associated with him. The competing electric-railway companies of Atlanta are the Atlanta Consolidated Street Railway company and the Atlanta Railway company.

It is reported that the Chicago City Railway company has withdrawn its financial support from the new Sans Souci summer garden at Cottage Grove avenue and Sixty-first street. Many residents of Hyde Park and Woodlawn regarded the project with disfavor, and there was some talk of trying to prevent the company opening the garden on the ground that it held a charter to move rolling stock and could not legally operate a place of amusement. President Hamilton of the company is reported to have said: "A railroad company cannot operate such an enterprise as this, and with its operation we will have absolutely nothing to do. I believe I have things in such shape that within a few days the company will not have a penny's interest in it."

Chicago newspapers assert that the construction of the General Electric Railway company's lines south of Twenty-second street will be begun in a few days. The Record has this information: "As soon as the litigation in the United States courts is disposed of the road will be built northward to the terminus at Jackson boulevard. The company has a traffic agreement with the Chicago City Railway company, but transfers will not be given from one system to the other. Officials of the Chicago City Railway and the General Electric companies are opposed to the installation of an underground trolley system, but they promise that a modern and effective motive power will be used." The Chicago and Western Indiana and the Monon steam-railroad companies are fighting the General Electric to keep the company south of Twenty-second street.

The Rockaway Electric Railway company and the Cross Country railroad, each with a capital of \$250,000, have filed articles of incorporation in the Queens county clerk's office, in Jamaica, N. Y. Patrick H. Flynn, the former trolley magnate of Brooklyn, is said to be behind the companies, which will gridiron Queens County. The Rockaway Electric Railway company proposes to build a double-track railroad at Rockaway Beach, about four miles in length, beginning at Central avenue, near Central street, and running to the New York, Woodhaven and Rockaway Beach railroad station at Hammel's. The Cross Country railroad will construct a trolley from Willets Point to College Point, through Flushing and through Dun-

ham street, South Road and Liberty avenue, Jamaica, to the Brooklyn city line, a distance of 15 miles.

The Havana Electric Railway company, which is composed mainly of Canadians, and was incorporated in January in New Jersey, has been organized with the following-named directors: A. F. Gault, Edwin Hanson, W. M. Donall and Frank Paul of Montreal, W. D. Mathews of Toronto, B. F. Pearson of Haliifax, N. S., G. B. M. Harvey, New York, and Percival Farquhar, New York. Mr. F. S. Pearson of New York is chief engineer of the company, and under his supervision plans have been made for equipping the railroad which runs from Regla to Guanabacoa and through each of these two towns, and recently taken over by this company. The work is expected to be finished by August 1st. It will then probably be the first electric railroad in Cuba. The company also owns the Regla ferry, running from Havana across the bay to Regla, there connecting with another line owned by the company.

A pleasant trip for Chicago city officials is outlined by Alderman Herrmann. At a recent council meeting he introduced a resolution, which was referred to the finance committee, providing for a roving street-railway commission. The resolution concludes as follows: "That the mayor appoint a commission of three aldermen, one civil engineer (if possible, a city employe), one electrical engineer (if possible, a city employe), whose duty it shall be during the summer vacation of the council to proceed to Boston, New York, Washington and such European cities as such committee shall find helpful, and make a thorough examination of topographical and other conditions, and of the state of mechanical and other progress in regard to the matters set out in the preamble hereto, to gather and collect detailed information, and to make report thereof to this council. The expense of such commission and clerical assistance, so far as such assistance may be necessary, and may be approved by the mayor, shall be paid out of moneys not otherwise appropriated."

AUTOMOBILES.

The Consolidated Traction company, Pittsburg, Pa., is about to add to its equipment in Pittsburg an automobile emergency wagon for use on its lines, particularly on the streets in the East End. It has been built by the Pope Manufacturing company. The new wagon will have a storage battery that will give it a mileage of not less than 15 miles at an average speed of 10 miles an hour on ordinary city streets where the average grade does not exceed one per cent., and where the maximum grade does not exceed to per cent.

Martin Maloney, who is actively interested in the Electric Vehicle company of New York, the parent company of the Illinois Electric Vehicle Transportation company of Chicago, of which Samuel Insull is president, was in Chicago last week. The Electric Vehicle company recently purchased the Siemens & Halske company, and it is presumed that the readjustment of the affairs of the latter company and the beginnings of the business of the Illinois company were the subjects of Mr. Maloney's conferences with the Chicago men interested.

PUBLICATIONS.

The Western Electric company has in press a bulletin fully describing hot-wire ammeters and voltmeters. These instruments may be used upon either direct or alternating current and are made either for switchboards or for portable use.

A handsome design, when appropriate, enhances the value of an advertisement. To attract attention is the first requisite of an "ad." How this may be done is shown in a booklet just issued for free distribution by the Trade Paper Advertising Agency, 150 Nassau street, New York city, which has secured the services of Harold McGill Davis, the experienced "ad" writer and designer. The booklet contains some effective designs.

The National Electrical Code, comprising the underwriters' rules for electrical wiring and the installation of apparatus, brought down to date, is issued in compact pamphlet form, suitable for the pocket, by the Underwriters' National Electric association. A quarterly "Supplement," giving a list of electrical fittings approved by the underwriters, is also issued. Information about these pamphlets may be had of W. H. Merrill, Jr., 67 East Twenty-first street, Chicago.

The eleventh edition of the catalogue and price-list of the presses, dies, drop hammers and other machinery made by the E. W. Bliss company of 17 Adams street, Brooklyn, makes an imposing cloth-bound volume of over 500 pages. It is, however, of convenient size for the hand and well adapted for the engineer or dynamo builder's reference library. This company makes machinery especially adapted for punching armature disks and sections, and its products have an excellent reputation among electrical men. It directs especial attention to its new-pattern inclinable power press.

The past decade has witnessed a great advance in the art of catalogue-making, particularly in the machinery trades. The modern catalogue must not only be attractive, but it must, above all, serve in

the best manner possible its primary purpose of furnishing information. Illustrations must be clear, explanations explicit and all information concisely given. The substantial character of most machinery demands similar character in the make-up of the catalogue describing it. Bold, clear type, good taste and simplicity in composition and first-class ink and paper have a subtle influence in impressing the reader with the idea of the high quality of the article described. Excellent examples of good catalogue-making are presented by the B. F. Sturtevant company. The publications of this company are of two classes—first, those which are purely educational in their character, comprising treatises on various subjects, leaflets regarding attendant advantages, etc.; second, the regular trade catalogues of the standard dimensions, 6½ inches by nine inches, each devoted to a specific line of manufactured goods. Separate catalogues in the same class bear the same cover design, but are printed and bound in different colors with proper titles, so that they may be readily distinguished. All catalogues are designated by individual numbers, the latest being No. 110. The most recent products are immediately presented by bulletins (designated by letters) preliminary to the issuance of complete catalogues regarding the given machines. Loss of time is thereby avoided, and the new designs can be sooner placed before the public.

INDUSTRIAL COMBINATIONS.

A. M. Young of New York and Waterbury, Conn., who is one of the prime movers in the scheme for uniting the trolley, gas and electric-lighting and power companies of Connecticut, is quoted as saying in an interview: "The Central Railway and Electric company of New Britain, the Waterbury Traction company of Waterbury, the Naugatuck Electric Light company of Naugatuck, the Norwalk Gas Light company, the Norwalk and South Norwalk Electric company, the Greenwich and the Housatonic Power companies have been purchased by R. A. C. Smith and his associates, who represent a strong syndicate of New York capitalists. It is their purpose to turn these properties over to the Connecticut Lighting and Power company. The purchase, together with the improvements and extensions contemplated, will represent an expenditure of about \$6,000,000. The development of the Housatonic Power company on the Housatonic River will contemplate the delivery of about 30,000 horse power in electric power through these various companies, which will be absorbed in the one company. This power is so centrally located that it can be readily and economically delivered to all the cities in the southern and western portions of the state."

TECHNICAL SCHOOLS.

Walter B. Snow of the engineering staff of the B. F. Sturtevant company of Boston presented a paper on the "Influence of Mechanical Draft Upon the Ultimate Efficiency of Steam Boilers," before the Engineering society at Columbus University on December 1st. The inquiries for copies of this paper have led to its publication in pamphlet form. It can be procured upon application to the B. F. Sturtevant company.

The Year Book of the Society of Engineers of the University of Minnesota is out for 1899. It contains a number of technical articles by Professors George D. Shepardson, John J. Flather, Morgan Brooks and others. The subjects of the three gentlemen named are, in order, "Methods of Transmitting Intelligence," "The Strength of a Gear Tooth" and "Engineering and Finance." In all there are 11 articles, suitably illustrated. The book is sold by the Society of Engineers, University of Minnesota, Minneapolis, Minn.

ELECTRICAL SECURITIES.

The new Traction and Electric company of Washington, D. C., offers to investors \$12,000,000 of a proposed issue of \$20,000,000 4½ per cent. 50-year bonds. The new company is to be capitalized at \$12,000,000, and will take over the Potomac Electric Power company and the United States Electric Lighting company, as well as the Metropolitan, Columbia, Anacostia, Georgetown, Brightwood, Forest Glen, Great Falls and Rockville street-railway systems. It is said that at the present rate of earnings the new company will be able to pay bond interest and about 2½ per cent. on the stock.

The New York Gas and Electric Light, Heat and Power company, of which Anthony N. Brady is president, offers for subscription \$5,000,000 of its first-mortgage five per cent. 50-year gold bonds, which are part of an issue of \$15,000,000. The company is to manufacture and purvey gas, both for illumination and for fuel, and electricity for producing light, heat or power throughout Greater New York. It owns or controls the Mount Morris Electric Light company, the North River Electric Light and Power company, the New York Heat, Light and Power company, the Yonkers Electric Light and Power company, the Borough of Manhattan Electric company, the Block Lighting and Power company No. 1, the Manhattan Lighting company, the Consolidated Telegraph and Electrical Subway company, and the Edison Electric Illuminating company of New York. Through the last

two companies named it owns the underground conduits by which alone electricity for lighting, heating and power purposes may be conveyed in New York city. There are now 300 miles of these subways in the borough of Manhattan and there are 250 miles of special tubing and cables. The conduits cost \$6,500,000 and have an annual rental value of \$750,000. The right to construct additional conduits as the necessity for them arises, either through the increase of its own business or the desire of other corporations to send electricity along underground conductors, is also owned by the New York Gas and Electric Light, Heat and Power company.

TELEGRAPH.

Many telegraph lines have been constructed in Mexico recently. The government has assumed possession and control of the line from Tepa to Pichucaclo in the state of Chiapas. The earnings for the latter half of 1898 were increased over 21 per cent. over the corresponding period of the year 1897.

The final details have been arranged for the laying of the cable between the United States and Germany, the last step being a satisfactory arrangement concerning government messages and tolls. The authorities at Washington have been informed that the actual work of laying the cable will be begun this summer and that the first message may pass over the line in the fall.

After encountering many difficulties, the Amazon Telegraph company has at last decided to abandon the cable in the River Amazon from Para to Manaus, but a land line is being constructed by the same company, with some reaches of cable. The company has issued bonds for the sum of \$625,000, with interest at five per cent. The paid-up capital amounts to \$1,250,000. A subsidy was granted by the Brazilian government, amounting to \$85,625 a year for 20 years.

In Boston the telegraph operators of the Associated Press in New England met recently and organized a society to be known as the New England Telegraph Corps of the Associated Press. A dinner was served at the American House, and at the business meeting the following-named officers were elected: President, E. M. Fisher, Boston; vice-president, R. E. Grandfield, Fall River; secretary, P. J. Stewart, Manchester, N. H.; treasurer, C. G. Rogers, Boston.

Emperor William, who seems to be taking a keen interest in the project for having a new cable laid between Germany and this country, has invited George G. Ward, vice-president and general manager of the Commercial Cable company, to cross the ocean and proceed to Cologne to attend a conference to be held there at an early date, the object being to push the plans for the laying of the cable. Mr. Ward sailed from New York on May 17th for Southampton en route to Germany.

In the House of Lords, May 15th, the Earl of Aberdeen asked, in view of the importance of arriving at an understanding with Canada and the Australian colonies in reference to the Pacific cable, if the government was disposed to reconsider some of its stipulations. The Earl of Selborne, under secretary for the colonies, said that the conditions were such as in the experience of the postoffice and the treasury had been considered prudent to make the work efficient. The government, he said, was prepared to review the whole matter in the light of any representation which might be made with a sincere desire to arrive at a mutually satisfactory decision.

MISCELLANEOUS.

It is said that the War Department at Washington is considering the advisability of soliciting offers for franchises for electric railways, gas and electric-light systems in Porto Rico.

A company which claims to have discovered a noiseless electrical typewriter that will revolutionize the business of typewriting by doing away with the pressure on the keys has been incorporated in New York state. It is known as the General Invention and Promoting company. The directors are Harry Bates, Joseph A. Murphy and Jessie Don Ennis. The capital stock of the company is \$5,000. Besides introducing the new typewriter, the company will protect and promote the inventions of George H. Ennis of Troy, who is the inventor of the typewriter in question, and also a process for refining iron, an electric motor, a process for heating and ventilating, a process for refining whisky and a process for generating power.

A committee of the City Council of Helena, Mont., after conferring with the county assessors, has valued franchises for tax assessment as follows: Helena Consolidated Water company, \$400,000; Western Union Telegraph company, \$1,000; Postal Telegraph company, \$1,000; Bell Telephone company, \$2,000; Helena Gas company, \$1,000; Helena Electric Light company, \$200,000; Independent Associated Press franchise, \$25,000; Herald Associated Press franchise, \$15,000; Helena Water and Electric Power company, \$1,000; Great Northern company, \$20,000; Northern Pacific Railway company, \$20,000. While the legality of the assessment will doubt-

less be determined in the courts, prominent attorneys say that the assessors have not acted without their functions as prescribed by law. It is believed that Helena is the first city in the country to tax press association and steam-railroad franchises.

TRADE NEWS.

George Cutter of Chicago says that he has another specialty nearly hatched. The newcomer will go by the name of "Cutter's arc cutout."

Since January 1st the Garton-Daniels Electric company of Keokuk, Ia., has shipped its arresters into every state of the Union and has made over 50 shipments abroad. It also states that the sale of these devices from January 1st to the present time are equal to the total sales of any preceding year. This success is taken as convincing proof of high merit in the company's devices.

The Simplex Electrical company of Boston reports a heavy rush of orders. Contracts have been recently secured by this company for furnishing all the electrical conductors in the new Williamson and Rose buildings of Cleveland, the Allen County court-house at Fort Wayne, Ind., and the Montgomery Ward building in Chicago. Mr. H. R. Hixson, with office at 1137 Monadnock building, Chicago, is the western selling agent of the company.

The electrical business at Fort Wayne has been run during the last 10 years under two or three different names—the Fort Wayne company, corporation and works—which has caused considerable confusion to the present management. A great many customers of the old company do not seem to have noted the last change in name, and a good deal of mail that is intended for the present concern, it is complained, goes to others, causing delay in reaching those from whom it is intended, which is embarrassing to all concerned. The Fort Wayne Electric Works is the name of the concern now.

Bids will be opened on July 1st, at the Sandy Hook proving grounds, Governor's Island, New York, for furnishing electrical material and supplies during the next fiscal year. Information will be furnished upon application to Major Frank Heath. The lowest bid for furnishing the New York navy yard with two generating sets, with compound engines and spare parts, was that of Burhorn & Granger of New York, at \$4,490.76. For furnishing the Norfolk navy yard with four direct-connected generating sets and spare parts the lowest bid was that of the Thresher Electric company of Dayton, O., at \$8,340.20. The proposal of the Crocker-Wheeler company of New York, in amount \$1,880, for furnishing electrical apparatus for Sandy Hook light vessel No. 51, has been accepted.

BUSINESS.

The construction department of the Western Electric company has secured the contract for wiring 5,000 lights in the Williamson building, Chicago.

"We must remain in town some of the time," says the Central Electric company of Chicago; and from this statement it argues that a Central Electric fan motor should be installed as a heat-dispeller.

Samuel Mankowitz, Chicago, dealer in general electrical supplies, reports an excellent trade. Mr. Mankowitz states that the demand for the goods he handles has increased from month to month, and he is now doing a better business than ever before. Mr. Mankowitz is well known to the electrical fraternity, and he is said to quote prices that usually secure the business.

As the temperature increases, so does the desire to keep cool. To this end a positive circulation and renewal of air is necessary, and may be secured in the simplest manner by an electrically driven fan. A most carefully designed apparatus of this type is that illustrated and described by the B. F. Sturtevant company in its "Bulletin M." The fan is designed to move air in large volumes, not merely to agitate it.

The Electric Appliance company has decided to bring out its well-known Acme tape hereafter under the name of "Eaco." This has been made necessary for the protection of the company's customers and itself as the reputation gained by the genuine Acme tape has caused the name to be adopted by manufacturers of what is said to be an inferior tape. The trade will appreciate this move, as poor tape is about the least desirable article known to electrical men.

W. N. Matthews of St. Louis reports that he has disposed of all of the No. 0000 stranded and Nos. 4, 8 and 10 weatherproof wire from his second-hand stock, also two 15 by 20 Russell engines, one 20 by 27 Russell engine, two 100 horse power boilers, one 3,000-light Westinghouse dynamo and a large lot of smaller material. He attributes his success in making the sales to the splendid condition of the machinery and material, which he is selling at low prices.

John S. Nowotny is an arc-lamp maker of long experience, and it may easily be believed that his new semi-vacuum, long burning, enclosed arc lamp is meeting the success that is claimed for it. He

says that he has all the lamp business that he can well handle, and that of all the new lamps put out none has been unsatisfactory. Mr. Nowotny, whose address is 313 East Second street, Cincinnati, thinks that, without exaggeration, his latest lamp is the best of the long-burning type that has been produced.

The Kester Electric Manufacturing company of 245 South Jefferson street, Chicago, is calling special attention to Kester's self-fluxing solder. This solder is especially made for all kinds of electrical work and, it is claimed, saves labor, time and money. It is said to make a perfect, secure, sound and non-corrosive joint. The company will be pleased to send samples and prices of the solder on application. The Kester company also manufactures the well-known Kester wire-cloth dynamo and motor brush, which is said to be giving satisfaction.

The Turner Engineering company of Bucyrus, O., will erect at once a complete boiler plant for the Marion Steam Shovel company, including a large self-supporting steel chimney, brick-lined, after special designs. The Marion company sends its shovels and dredging machinery to all parts of the world, and maintains its plant with the most improved money and labor-saving devices. After careful and exhaustive consideration of all water-tube boilers, the management decided to use the Turner boilers as possessing the greatest merit and economy.

The Charles Munson Belting company, recently organized, is now in a position to supply all of its patrons with belting. For a period covering

33 years the Munson belt has maintained a high reputation among American manufacturers, and the new company promises to use the same careful workmanship and supply the same high grade of leather as those which made the belt appreciated in the past. The reorganized company is fully equipped to furnish the best belting of all grades of pure oak tannage upon short notice. The address of the company is 22 to 36 South Canal street, Chicago.

President Edwin Raster of the Raster Carbon Rheostat company, Chicago, announces that his company is receiving more orders for rheostats than ever before, and that the business of the last two months has shown a large increase. The Raster rheostats are now in use all over the United States, and their merits are becoming better known from day to day. The Raster company has recently received some large orders from the Chicago City Railway company and others. It has recently issued a new descriptive catalogue and price-list, showing all of the company's latest improved types of rheostats. This book will be mailed to anyone on request.

E. E. Calkins, special agent for the Mexican Plantation association, 100 Washington street, Chicago, desires to call the attention of the electrical fraternity to the investment plan which the association is offering the public. The association offers shares at a small figure, payable monthly, and states that a life income of \$125 a month can be realized

from the investment. It is claimed that all but a few hundred shares have been sold, and it is expected that the balance will be disposed of by July 1st. The association has deeded its land to the Chicago Title and Trust company, and has filed a guarantee bond of \$100,000 with this company as an evidence of good faith with its shareholders. It is claimed that many prominent men are interested in the association. Further information will be furnished by Mr. Calkins on request.

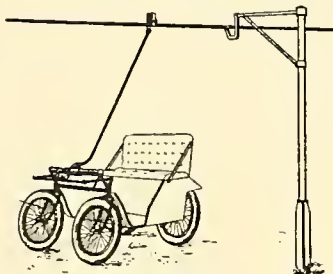
As is now generally known throughout the East, the Chesley Electric company, Havemeyer building, New York was recently succeeded by the Chesley Machinery company. The latter is dealing largely in second-hand electric machinery, and is making a special drive for western trade. Its second-hand dynamos and motors are thoroughly overhauled and tested, supplied with new wearing parts and are guaranteed to give satisfactory service. The company states that it often has new machines that have never been used, and also machines that have been entirely rebuilt. It supplies many large concerns and has also sold second-hand dynamos to the United States government. A specialty is made of repairing heavy electrical machinery, for which the company has excellent facilities. Paying the highest prices for labor, the work is first-class. The factory is open day and night. As the Chesley Machinery company is now making a special effort for western business, purchasers of second-hand machinery would do well to have on file the company's list of bargains and stock on hand.

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued June 6, 1899.

626,296. Device for Steering Motor-driven Vehicles. Edward J. Pennington, Walton-upon-Thames, England. Application filed December 30, 1897.

The means for steering a motor-driven road vehicle comprise an overhead wire or cable and an arm connected at its lower end to the steering apparatus of the vehicle and carrying at its upper end a pulley or the like which travels in engagement with the wire or cable.



No. 626,296.

626,298. Coin-controlled Electric Meter. Samuel L. Phillips and George G. Tilden, Washington, D. C. Application filed January 20, 1899.

A spring-closed switch is employed to make and break the circuit, a coin-operated lever having a latch to sustain the switch when open, an electric motor to open the latter, a circuit for the motor completed by the a tion of the metering mechanism, and means operated by the motor to open the switch and to break the motor circuit.

626,331. Process of Producing Neutral Chromate of Lead. Carl Luckow, Cologne-Dentz, Germany. Application filed December 31, 1897.

The process of producing neutral chromate of lead by means of electrolysis consists in using an anode of lead in connection with an aqueous solution as electrolyte containing from three-tenths to three per cent. of the sodium potassium or ammonium salts of chloric acid in mixture with the sodium, potassium or ammonium salts of chromic acid, passing electric current through the solution and maintaining the bath constant by the continuous addition of water and chromic acid.

626,361. Method of and Apparatus for Electroplating. Alfred A. Blackman, New York, N. Y. Application filed September 27, 1898.

The method is described of electroplating irregularly shaped articles by moving them continuously in one direction through the solution and changing their individual positions by continuous tumbling while subject to the electroplating current.

626,364. Automatic Fire-alarm System. Robert G. Callum and John W. Fritch, Washington, D. C. Application filed February 23, 1899.

An electric signal-transmitting instrument is operated by windable mechanism, a closed-circuit annunciator, and means whereby a circuit of the annunciator will be opened by the operation of the instrument and kept open until the instrument is set for another operation.

626,377. Electric Rail-road. Samuel H. Harrington, New York, N. Y. Application filed June 16, 1898.

A rail road having conical thimbles or plugs at its ends in combination with a conically perforated rail or rails into which the plug or plugs are tightly driven, and an anchorage for the plugs consisting of an edge portion of the rail driven inward from the edge of the rail perforation into the metal of the plug in tight frictional contact therewith after the plug is seated in the perforation.

626,378. Electric Rail-road. Samuel H. Harrington, New York, N. Y. Application filed June 16, 1898. Renewed February 28, 1899.

An electric rail road having conical thimbles and loops secured to its smaller ends in combination with annular wedge-shaped rings having slots of different depths and wedges adapted to enter the loops and rest in slots in the rings.

626,382. Auxiliary Electric Alarm for Telephone Call Bells. Morton M. Humphrey, Siloam Springs, Ark. Application filed May 27, 1898.

The combination with the magneto call box, its vibrating armature and the receiver lever, of an auxiliary alarm circuit terminating at the box, a gravity contact lever adapted to close the circuit, a trip lever projecting into the path of the armature and adapted to support the contact lever, and a setting lever having its vertical arm extending across the path of the tripping lever and its horizontal arm extending across the path of the receiver lever.

626,460. Filament for Incandescent Lamps and Process of Manufacturing Same. Thomas A. Edison, Llewellyn Park, N. J. Application filed March 31, 1898.

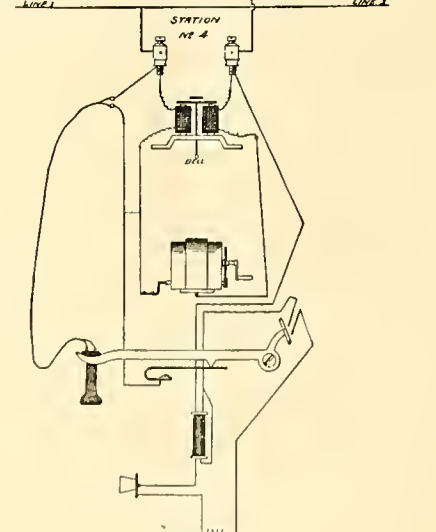
An improved filament for incandescent lamps, consisting of a highly refractory, non-conducting material, having isolated particles of conducting material therein.

626,462. Telephone System. William D. Gharky, Philadelphia, Pa. Application filed December 24, 1898.

A multiple-station metallic telephone circuit having at each station two bridges containing impedance and a conductor connecting the inductively middle point of each of the bridges with the ground, a signal-receiving instrument connected to respond to current in one of the ground conductors and a generator arranged to send signaling current through the other of the ground conductors to the line.

626,463. Telephone System. William D. Gharky, Philadelphia, Pa. Application filed December 24, 1898.

A multiple-station metallic telephone circuit having at each station two bridges containing impedance and a conductor connecting the inductively middle point of each of the bridges with the ground, a signal-receiving instrument connected to respond to current in one of the ground conductors and a generator arranged to send signaling current through the other of the ground conductors to the line.



No. 626,624.

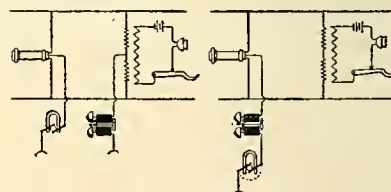
One claim is given: In a telephone system a metallic circuit extending to a number of substations and common to all of them, coils of high impedance bridged across the metallic circuit at the various stations, branches from the middle points of the coils to earth or a return wire, signal-receiving instruments included in the branches, signal-transmitting instruments adapted to be connected across the metallic circuit at the various substations, and central-office apparatus comprising suitable receiving and transmitting apparatus to co-operate with the apparatus at the substations.

626,494. Electrical Signaling. Simon de Jager, Paterson, N. J. Application filed May 26, 1898.

Two sets of devices are adapted to coactively operate with means for sending electrical impulses of both polarities, and electrically controlled means, distinct from each other and actuated by the impulses, for operating the respective devices, the means being adapted to effect a coaction of their respective devices when one is actuated by an impulse opposite in polarity to and succeeding the last actuating impulse of the other.

626,496. Electric Motor or Dynamo-electric Machine. Robert Lundell, New York, N. Y. Application filed January 18, 1899.

A brush holder having a metal supporting shank surrounded by a substantially square insulating sleeve and clamped in a holder which permits the shank to be adjusted in a plane parallel with the diameter of commutation on the commutators.



No. 626,462.

626,501. Magazine Target Gun. John L. McCullough, New York, N. Y. Application filed February 24, 1899.

The combination is claimed with a magazine gun and a magazine lock connected with the gun and controlling the supply of cartridges thereto, of an electric circuit including a generator and a lock-controlling electromagnet, mechanism between the magnet and lock, whereby the magazine is unlocked by the excitation of the magnet, a coin chute, means whereby the dropping of a coin into the chute closes the circuit, a coin detainer in the chute and controlled by the circuit, and means whereby the cartridge moving out from the magazine breaks the circuit and sets free the detained coin.

626,592. Insulator. John A. Carpenter, Oxville, and Charles F. Tonn, Bluffs, Ill. Application filed November 15, 1898.

An insulator is described comprising two sections, lugs extended from one of the sections and adapted to be secured to the other section, the lugs being spaced apart and having their adjacent faces curved, and a yielding material between the lugs.

626,606. Telegraph Receiver or Relay. José Gallegos, San José de Guatemala, Guatemala. Application filed December 24, 1898.

The movable armature, the electromagnet having an end or pole movable in a plane perpendicular to that in which the armature moves and a circuit closer controlled by the movement of the armature are features claimed.

626,624. Circuit and Apparatus for Bridging Telephones. Charles T. Mason, Sumter, S. C. Application filed February 4, 1899.

A multiple-station telephone circuit having at each station a normally closed bridge of the main line including both bell-ringing magnets of low resistance and the armature coils of the generator, the bell magnets being permanently in series with the generator and adapted to be shunted in signaling.

626,629. Telephone. George F. Payne and Albert K. Keller, Philadelphia, Pa. Application filed April 13, 1897.

A telephone-substation apparatus comprising in combination a box or casing having a door, a fixed support within the casing, a movable support carrying a receiver and transmitter and pivoted at one extremity to the fixed support, a rotary switch connected to the movable support to be actuated in its motion and thereby change the telephone circuit, the movable support being adapted to project forwardly and without the box or casing when turned into the position of use, and when in such position constituting an impediment to the closure of the box door.

626,635. Process of Reducing Aluminum from Its Compounds. Gustav Schwahn, St. Louis, Mo. Application filed September 7, 1897.

As a process, subjecting a hot compound vapor containing aluminum to the action of a hot carbon-gas decolorizer, in the presence of incandescent carbon, for an appreciable length of time, while substantially excluding the air.

Western Electrician

EVERY SATURDAY.

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CHICAGO, JUNE 24, 1899.

No. 25

Death of Norman Williams.

The death of Norman Williams at Hampton Beach, N. H., on June 19th, removed an interesting figure from public life and closed the career of one who had much to do in shaping the early course of the telegraph and telephone interests of this country. Norman Williams was an able lawyer and a wise counselor, and his very able management of the legal complications growing out of the organization of the Western Union Telegraph company was an important factor in the adjustment of the conflicting interests involved in that great scheme.

It was in connection with the Western Union affairs and in conducting the legal battles of that company that Mr. Williams won his great reputation as a lawyer. This was probably the most important work of his career, and it served to give him a national reputation in his profession. Unfortunately for the legal fraternity, Mr. Williams acquired so many other interests that his attention was directed from the practice of the law, and of late years, although still a member of the firm of Williams, Holt & Wheeler, he was mainly engaged in other affairs. In another respect, however, this was fortunate, for the loss of the legal fraternity was more than compensated in the great public service which Mr. Williams was able to perform in promoting the educational and charitable institutions of Chicago, to which he gave a large part of his attention.

Mr. Williams' interest in electrical matters dated back to the early days of the telegraph, and his prominence in the Western Union litigation naturally resulted in his acquiring an intimate knowledge of the subject and brought him into personal contact with the leaders of the profession. Consequently, when the telephone appeared on the scene Mr. Williams directed his attention to this new means of transmitting intelligence, and, aside from his legal connection with the Bell interests, he became a prominent figure in the commercial development of the industry. He had since been closely identified with the Bell companies throughout the West, and at the time of his death held large interests in Bell properties.

By birth Mr. Williams was a New England man, but in all that pertained to the advancement of his adopted city he was thoroughly a Chicagoan. His parents were Norman and Mary Anne (Wentworth) Williams, who lived at Woodstock, Vt. He was born on February 1, 1835, passed his boyhood in Vermont, and was fitted for college at the Kimball Union Academy at Meriden, N. H. After completing his studies there he attended the University of Vermont, from which he graduated with the class of 1855. This was followed by a course at the Albany Law School and service in the office of Tracy, Converse & Barrett at Woodstock, Vt., after which Mr. Williams was admitted to practice as a lawyer in the New York and Vermont courts.

Mr. Williams' ancestors had long been prominent in New England history. His great-grandfather was one of the grantees in whom the English crown intrusted title to the town of Woodstock, and the succeeding generations were identified with the early political and military struggles of Vermont. Mr. Williams' grandfather, Jesse Williams, and his father, Norman Williams, were also interested in the public affairs of the state, and were men of much influence. The Wentworth family, of which Mr. Williams' mother was a member, was of English descent, and some of the male members served as governors of New Hampshire under the English kings in colonial days. They were members of the Tory party, and left the country when the British troops evacuated Boston.

With a family history of this kind there were consequently many ties which bound Mr. Williams to New England, but he was ambitious and sought his opportunity in Chicago. He removed to this city in October, 1858, and for two years practiced law alone. In 1860 he became associated with Messrs. King and Kales, the firm name being King, Kales & Williams. This was continued until 1866, when Mr. Williams withdrew and with General John L. Thompson established the famous law firm of Williams & Thompson, which continued until the death of General Thompson in 1888.

Mr. Williams, whose reputation as a business lawyer was won early, was identified in the formation of some of the largest and most successful enterprises ever undertaken in the West. In his professional capacity he assisted in the organization of

dent of the institution, and personally directed the work of organization. As a director of the Chicago Public Library, Mr. Williams was an active worker for the educational interests of the people, and suggested many valuable improvements. He performed valuable services as United States Commissioner to the Paris Electrical Exposition of 1881.

He was a member of the Chicago Club, Calumet Club, Literary Club and the University Club (Chicago and New York). In addition to native qualities which made him a widely beloved and respected man, Mr. Williams had the advantage of a thorough education, both by books and travel, having made extensive tours in the United States and foreign lands.

Mr. Williams was a trustee of the Second Presbyterian Church of Chicago and took a very active interest in its welfare. The Chicago Orphan Asylum was another institution of which Mr. Williams had long been president and in which he took great interest. In politics he was a Republican, and while he neither held nor sought office, he was much interested in the good conduct of public affairs, and labored assiduously to secure it. Mr. Williams was active during the first year of the Civil War in securing armor for the first regiment of colored soldiers recruited in Chicago. Mr. Williams was married at Ottawa, Ill., December 11, 1867, to Miss Catherine Caton, daughter of Hon. John Dean Caton, formerly chief justice of the Supreme Court of Illinois. There are three children living, two daughters, Laura and Mary, and one son, Norman. The elder daughter, Laura, married Major-general Merritt in London, Eng., October 24, 1898.

For several years before his death Mr. Williams gave comparatively little attention to his profession. Much time was required for his own affairs. He was interested in the Western Electric company, the Chicago Telephone company and the Central Union Telephone company.

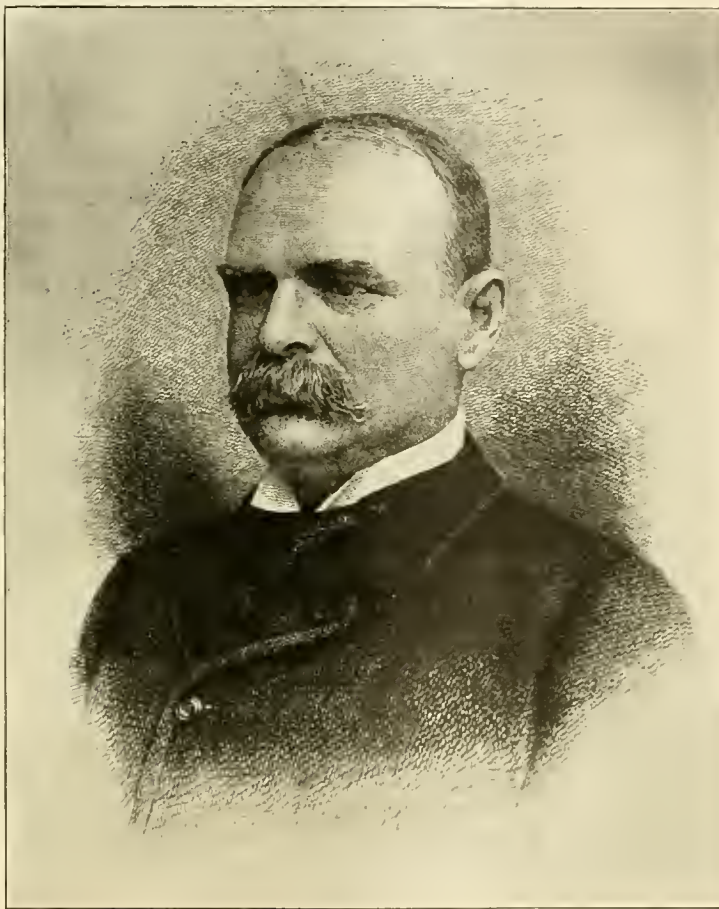
Mr. Williams had been a sufferer from Bright's disease for three years. He went to his summer home in New Hampshire in April and failed gradually until death relieved him of his sufferings. All of his family attended him, including his wife and son, Norman Williams, Jr., his daughter, Miss Mary Williams, his son-in-law, General Wesley Merritt, and wife. They were at the bedside at the last.

The funeral was held at his summer home on Wednesday evening. The services were simple in character and were conducted by the Rev. David N. Evans, pastor of the Congregational Church at North Hamp-

ton. On Thursday morning the body, accompanied by the family, was taken on a special train to Boston and thence to Woodstock, Vt., where the interment took place.

Automobiles in Chicago.

At a meeting held last week the South Park commissioners of Chicago took the extraordinary measure of barring automobiles from using the South Side parks and boulevards of Chicago. The rule applied to all styles of automobiles, whether used for pleasure or by business houses for delivering goods. The argument for the exclusion was that the vehicles are a menace to the safety of pedestrians, bicyclists or persons driving in the parks or boulevards. The park police were ordered to enforce the rule, and Messrs. C. F. Woods, C. F. Corrigan, H. G. Osburn, W. Clyde Jones and G. S. Marchant were active in opposing it. However the new rule was so unreasonable that the board itself saw its absurdity, and the commissioners allowed it to become a dead letter.



NORMAN WILLIAMS.

Pullman's Palace Car company and became a member of its first board of directors. Mr. Williams also assisted in the organization of the Western Electric company and the Chicago Telephone company, and it is claimed that the first telephones used in Chicago were brought here under his direction. As already mentioned, the Western Union Telegraph company was another corporation in which Mr. Williams was prominently interested, especially in the management of its legal battles with the opposition companies in the West.

Owing to his faculty for disposing of business quickly, Mr. Williams, although giving minute attention to the details of the many affairs entrusted to him, found time to take an active interest in literary matters. He aided his brother, Edward H. Williams, who founded a public library in his native town, Woodstock, Vt., which is called, in honor of his father, "The Norman Williams Public Library." When the late John Crerar made his magnificent bequest for a great public library in Chicago, he named Norman Williams and Huntington W. Jackson as trustees. Mr. Williams was the first presi-

DEVELOPMENT OF THE TELEPHONE FIELD.

Independent Telephone Association.

The convention of the Independent Telephone Association at the Auditorium Hotel, Chicago, next week, promises to be an enthusiastic gathering. Many prominent and influential leaders in the independent movement, who have heretofore held aloof from the association, have joined with the officers and committees this year in the preliminary work, and all are working in harmony toward making this meeting a turning point in the history of the organization. Under date of June 20th, Judge Thomas writes: "Indications are at this writing very encouraging, and I think we will have the banner meeting of the association." Reports from exchange managers and from representatives of manufacturers and dealers from all parts of the country confirm this view.

The meeting next week will be conducted under the direction of the following-named officers and committees:

President James M. Thomas; first vice-president, H. C. Young; second vice-president, S. T. Slade; third vice-president, J. B. Ware; secretary and treasurer, W. J. Vesey; first assistant secretary, G. W. Beers; second assistant secretary, D. C. Dow. Advisory board, James M. Thomas, William J. Vesey, H. D. Critchfield, Hugh Dougherty, E. B. Fisher. Executive committee, I. A. Lumpkin, S. P. Sheerin, C. F. Bennett, T. A. Pedley, E. B. Fisher, H. D. Critchfield, H. C. Young, F. F. Sapt and D. A. Mossman.

The programme for the convention and the entertainment features, as approved by the advisory board, follow:

MONDAY, JUNE 26TH.

The executive committee and the advisory board will meet at eight p. m., in the parlor of the Auditorium Annex, to settle all business matters of the closing year, and to formulate reports of officers and committees.

TUESDAY, JUNE 27TH.

The first session of the convention will be held in the banquet hall of the Auditorium Hotel at 10 a. m., and will be opened by the president, Judge James M. Thomas, who will deliver the annual address. Reports of the officers and committees will then be submitted.

This will be followed by introductions and a short social session, at which new members will be received.

The afternoon session, which will introduce new features in the order of proceedings, will open at two p. m. and the following programme will be observed:

Paper, by S. P. Sheerin of Indianapolis, president of the New Long-distance Telephone company of Indiana. Subject: "Value of Long-distance Toll Lines." Discussion.

Paper, by C. L. Boyce, manager of the Citizens' Telephone company of Grand Rapids, Mich. Subject: "Operation and Maintenance." Discussion.

Paper, by Maxime Reber, electrical engineer of the Cuyahoga Telephone company of Cleveland, Ohio. Subject: "Essentials of Telephone Construction." Discussion.

Paper, by Hon. H. D. Critchfield, counsel for the United States Telephone company of Ohio. Subject: "Development of the Independent Telephone Business." Discussion.

WEDNESDAY, JUNE 28TH.

The entire morning will be devoted to the inspection of exhibits, as no formal session will be held. Visitors who wish to examine the local factories will be afforded an opportunity of doing so at this time.

At three p. m. members will assemble at the Auditorium, where tally-ho coaches will be provided to take them through the city and the South Side parks and boulevards. The party will start from the Auditorium and ride north on Michigan avenue to Monroe street, west on Monroe to La Salle, south on La Salle to Jackson boulevard and east on Jackson to Michigan, thence south through the boulevards and parks. At Jackson Park a steamer will be in waiting to convey the party back to the city, affording a delightful view of the city from the lake.

At eight p. m. the banquet tendered by the Chicago manufacturers and supply men to the association will be given at the Auditorium Hotel. This will be the principal social feature of the meeting. The banquet hall will be appropriately decorated, and excellent music will be provided. The list of toasts will not be arranged until Monday evening, when the advisory board and executive committee will complete all the arrangements.

On June 14th Judge Colt, in the United States Circuit Court at Boston, Mass., granted a preliminary injunction on complaint of the Electric Storage Battery Company of Philadelphia against the Quincy and Boston Street Railway company, restraining the latter from using and operating the elements of the Hatch storage battery installed at South Braintree, Mass., and used as an auxiliary to the trolley system. The bill held that the Hatch battery infringes the British patent owned by the Electric Storage Battery company. The injunction becomes effective on August 1st, as the railway company was given sixty days to remove the infringing batteries.

Chicago Board of Trade Telephone System.

The telephone has found a special field of usefulness in connection with industries and enterprises requiring constant intercommunication between the several departments and the principals in special lines of transactions. An excellent illustration of this is found in the private-telephone system recently installed in the Chicago Board of Trade by the Stromberg-Carlson Telephone Manufacturing company of Chicago. It is essential to the successful execution of the important transactions made in this institution that immediate notification be sent from the floor of the Board to the offices of brokers or capitalists interested, and that facilities may be had for directing movements through agents in the pit from the principal's office. The telephone furnishes admirable means for communication in this manner, and it is now generally employed in Chicago for this purpose. Each office in the building is provided with one or more telephones connected on the switchboard system, as well as a number of

is largely used in the offices. All batteries in this system are placed at one point, thus avoiding the inconvenience of local batteries at each instrument. The ringing energy is also furnished from the central, which greatly increases the efficiency of the system, as users are not required to first turn the crank of a generator to signal the central office.

This is one of the most notable equipments furnished by independent manufacturers in Chicago, and as the service is very severe and exacting it is particularly interesting to exchange managers operating systems in competition with the Bell company.

American Electric Telephone Company's New Building.

About July 1st the American Electric Telephone company will move into its new building at 38 to 50 Jackson boulevard, corner Canal street, Chicago. This change in quarters was made necessary by the company's rapidly-increasing business, which has quadrupled during the last year, and has over-



FIG. 1. CHICAGO BOARD OF TRADE TELEPHONE SYSTEM.

instruments in the main corridor, and in the main hall on the trading floor. The system used is the regular public-exchange central-energy apparatus, furnished by the Stromberg-Carlson company.

Fig. 1 shows the switchboard, which has been installed on the third floor. It is equipped with tubular coil, visual signals, which automatically indicate when the station-instrument receiver is taken from the hook, showing the number of the station calling. The signals are controlled entirely from the station instrument, and are electrically restored. After connection has been made, the clearing-out signal is given, when both parties replace their receivers. The board is a very handsomely finished piece of work, and the design and material used indicate the character of the work that can be turned out for independent exchanges.

Fig. 2 shows several of the instruments used in the main hall. These instruments consist of a combination set, transmitter and receiver with hook and bell. They are neat and compact, and especially adapted for this work, as they are kept very busy during the trading hours each day.

Trades are made directly from the floor, and all trades are reported over these instruments to the clearing houses, thus saving considerable time and a large expense of messengers.

Fig. 3 shows the regular wall instrument, which

taxed the capacity of the company's present factory. The new building is a modern eight-story structure, covering half a block. It is being equipped with the very latest automatic machinery throughout, and it is claimed that it will be the largest and most finely appointed telephone manufactory in the world. The entire ground floor will be taken up by the company's general offices.

Mr. P. C. Burns, president of the American company, in speaking of the new building, said: "We have been forced to secure larger quarters in order to take the proper care of our customers. While our present factory is a large one, it is entirely inadequate to the demands made upon it, and it has been impossible to turn out our orders as promptly as desired. We will have a factory modern in every particular, and sufficiently large to meet the requirements of our business. The independent exchanges have multiplied so rapidly that the new quarters will not be any too large to take care of their interests."

Visitors to Chicago during the convention of the Independent Telephone association are especially invited to inspect the new building, although it is not yet completely equipped.

The Hawkeye Telephone company is putting in an exchange at Adair, Ia.

No Compromise.

By JAMES M. THOMAS.

If there is any reason why independent telephone companies should sell out to the Bell companies or contract with them for connection with the Bell system, that reason has not yet been given to the public. But there are a few companies in different parts of the United States which have been induced through some argument or by some means to enter into relations with the Bell companies, and some few have sold to them their properties.

To men who have been through a few years' experience and have learned the policy and methods

place themselves under bondage to the American Bell Telephone company to pay royalties upon inventions after the patents have expired.

The independent long-distance companies will soon extend throughout the entire country, and it is certainly better to wait till the friendly lines of these companies join into a complete new system reaching every local exchange in the country. This will bring greater prosperity to the local companies, whereas, that which is now offered places the control of the property of the local company in the hands of those who will not only absorb all the profits, but will ultimately force the local company to sell at a mere pittance.

If this matter is carefully considered, no company operating an independent exchange will enter into a contract with the Bell companies.

The Bell companies have apparently at last realized that the independents have grown stronger than they. They at least realize that the number of independent exchanges far outnumber their own in the United States, and that they are stronger in the aggregate financially, and that they are better managed and afford better service. It is true that the Bell companies are spending a great deal of money in new equipment, but the independents are even more active in this regard.

The burden of watered stock and the prejudice of the people because of poor service and arbitrary dealings impedes the Bell forces in the race and the independents are fast gaining; in many instances they have already passed the Bell, and in all they shall surely win the race. Why shouldn't they? The people desire to have it so.

It may be that the telephone business is a natural monopoly. We have always doubted it, but if it is, the monopoly will pass to new hands who employ modern business methods.

NEW COMPANIES.

The Delaware Valley Telephone company has been incorporated at Albany, N. Y., with a capital of \$25,000. The general route is from North Sanford to Afton, to Bainbridge, to Masonville, to Sidney, to Cannonsville, to Walton, to Sherman, to Hancock, to China, to Beebe Hill, to Binghamton. The points to be connected include prominent cities and villages in Broome and Delaware counties in New York, and Susquehanna and Wayne counties, Penn. The directors are E. A. Goodsell and Lewis Fredenburg of Afton, Chenango County; V. E. Greg-

Minor Telephone Troubles and How to Correct Them.

By H. P. CLAIBORN.

To those who are familiar with the construction of the simpler pieces of telephone apparatus it is a constant wonder that managers of telephone exchanges are so slow in awakening to the fact that an immense saving of time and money may be effected by equipping a room with a few inexpensive tools, suitable for rewinding an occasional coil or repairing slightly damaged parts of the equipment.

Nothing is more disastrous to good service than to have the "outside men" mingle with the operator. A room should be provided in which the men may store their tools and instruments. Better discipline can be maintained in the operating room, and the men of their own volition will do much that would otherwise be overlooked. Thus, tools will be cleaned, repaired and sharpened and kept in good condition, old bundles of drop wires straightened out, the short pieces being soldered together and retaped ready for future use, and most important of all, damaged parts of the exchange equipment will be gone over, repaired and put in working order.

As a preliminary to a general discussion of telephone repairs, let us first consider what elements enter into the construction of a telephone-exchange system. In the first place, we have the subscriber's station equipment, consisting as a rule of the following essential elements:

- (1) The hackboard, the battery support and cover, the magneto box and the transmitter box.
- (2) The hand telephone, the microphone transmitter, the induction coil and the battery.
- (3) The magneto generator and magneto bell
- (4) Switching appliances.
- (5) Instrument interconnecting circuits.

The first class requires but little treatment, aside from suggesting that if one element gives out—say, the battery cover—it is not a sufficient cause for returning the complete telephone to its maker. Any local cabinet-maker can do the job at a lower figure than the transportation charges would amount to. Adding to this the manufacturer's charges for unpacking, repairing, repacking and the return charges, it is small wonder that managers kick against the cost of so insignificant a job. The manufacturer, of course, receives the blame, but in reality he is a part looser as well, for the amount which he charges for the repairs scarcely covers actual cost, and he would gladly welcome the day when repair work ceases to interfere with his regular production of new goods.

In the second class, however, we find a variety of



FIG. 3 CHICAGO BOARD OF TRADE TELEPHONE SYSTEM.

of the Bell companies, this seems strange, and it is but natural that the mind seeks to know the inducement offered to accomplish this result.

The mere matter of bargain and sale viewed from the standpoint of a cold business transaction, of course, can be explained by the fact that in every instance a great deal more money has been offered than the property is worth—in some instances three or four times the actual value. This is a temptation too great for some men and therefore a sale follows.

But what brings about this condition? Why should the Bell companies offer such excessive prices? We have been told for five years, since the inception of the independent movement, by the entire Bell contingent, from the local manager up to the president of the American Bell Telephone company, that we are infringers of patents and have no right to exist and do business, and their learned lawyers and experts, who claim to be familiar with the state of the art, have been trying to support this view. If they are right, why pay such enormous prices for this property which belongs to their infringers? This is beyond the comprehension of business men, and places those learned in the art in a very embarrassing position, because their opinions are not now consistent with or sustained by the policy of the sub-Bell companies which exist only through the graces of the parent company, the American Bell.

We understand why men who, with the very best intention, start out to fight with a great army for a just cause, desert and join the enemy when dazzled and tempted with sudden wealth and position. It is only the weakness of man tried beyond endurance. And so we understand why a few independent companies sell when sorely tempted. But men should read and remember the histories of those in all walks of life who have been turned away by the glitter and gold which, in the hour of temptation, seems so dear and desirable. Regrets have always followed and we know of no exceptions in this, because the people who have trusted the men to give them cheaper telephone service do not like to have this right turned to financial gain by those men at the expense of those who gave the right to build the property. This is forcibly shown by the fact that in almost every instance the municipality grants another franchise to another local company shortly after the consummation of the sale. It would have been easy to understand in the early days of the independent movement why the local companies might have accepted a reasonable proposition from the Bell company for long-distance service, because the exchanges were isolated and the threats of litigation were loud and persistent; but now the circumstances are so different, the independent companies being so numerous and so strong, controlling at least seven-tenths of the pay business of the communities where the independent companies have entered, that there is no longer reason why a coalition with the Bell is either desirable or advantageous on the part of the local companies, and it shows bad business judgment to enter into any agreement for connection and thus



FIG. 2. CHICAGO BOARD OF TRADE TELEPHONE SYSTEM.

ory, G. L. Reilly, C. A. Philly, A. H. King, W. H. Crawford, F. C. Broad, Barton Springer and C. C. Swart of North Sanford, Broome County; G. C. Vallentine and L. Bielby of Deposit, Broome County; E. E. Crane, Diar Baker and E. L. Garlick of Sanford, Broome County.

Articles of incorporation of the Glen Telephone company of Montgomery County, with a capital of \$10,000, were filed June 20th at Albany, N. Y. Its operations are to be carried on from the town of Glen, and will connect with almost all of the principal cities, towns and villages in the state. The directors are J. S. Glen Edwards, A. Marshall Burt, Andrew A. Turnbull, Jacob W. Shelp, Edward Edwards of Glen, Howard A. De Graff of Fonda and Edward C. Evans of New York.

elements, each of which requires special treatment. In the first place, the hand telephone is subject to several ills. The most common of these is due to the fact that the relative distance between the magnet poles and diaphragm continuously varies. These changes, it is well understood, are due to the manner in which considerable variations of temperature affects the constituent parts of the instrument. Happily, however, this fault is rapidly being overcome by the universal adoption of modern types of receivers, in which the magnet system is supported in such a manner that the adjustment is not affected even by the most extreme variations of temperature.

Another serious fault is observed in the permanent magnet losing its magnetism, which may be due to several causes. Thus if a strong alternat-

ing current is allowed to pass through the magnet coils, the magnetized bars of steel become depolarized, which makes such an instrument almost useless for the purpose required. A direct current, if allowed to flow for an instant through the magnet coil, would tend to depolarize it, provided the current flowed in an opposite direction to the existing polarity. The only way to treat cases of demagnetization is, of course, to recharge the steel bars of which the magnet is constructed. This may be done without removing the magnet from the shell by placing the projecting pole pieces in contact with a comparatively much stronger magnet. The charging may be done by the extended field-pieces of a small dynamo, or better still, an electromagnet may be built and set up in the repair shop. Another method for recharging the magnet system of a hand telephone, whose magnet coils are intact, is to pass a strong current through them for one or two seconds (a 110-volt direct-current lighting main may be connected with a 100-ohm receiver six or eight seconds, without doing any damage. The magnets, however, will have been recharged to normal strength).

Having disposed of demagnetized or weak magnets, we may proceed to consider means for repairing burned-out, open and crossed magnet coils. When a coil is found to have been burned out, remove it from the shell and ascertain whether the spool-head has received any damage, which usually is true if constructed of fiber or hard rubber, in which case it is better to return the complete receiver to the factory for repair. On the other hand, if the spool ends are of a metal, remove all burned wire, and after scraping off the burned insulating paper, reinsulate and rewind the coils. Before restoring the coils to their position be sure that the permanent magnets are of proper strength, as they may have become damaged by the same current which burned the coils. One important feature of rewinding the coils, if there are two coils to a set, is that both coils must be wound in the same direction and have their inside ends connected together.

Open circuits in a receiver usually are found near

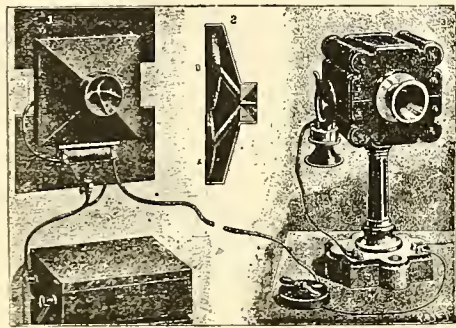


FIG. 1. LOUD-SPEAKING TELEPHONE.

one of the outside layers, and may be remedied by merely slacking up on the outside wire and reconnecting, all of which may be done without removing the coils from the magnets, which would destroy the adjustment of the several parts. It rarely occurs that an inside wire is found broken, but when such is the case it is necessary to rewind the damaged coil. The old wire can be used over again, if a little care is exercised in handling.

If on testing it is found that both cores of the magnet refuse to affect a diaphragm, while a generator current (alternating) passes through from one outside terminal to another, it may be that the outer wires are in contact with each other. This can be definitely determined by noting whether the diaphragm is affected when the current is passed from the inside wire to outside coil terminals. If on examination it is found that the cross is not in the wires extending from the coils to the binding posts, a piece of paper slipped between the coils often serves to locate and clear the cross.

The microphone transmitter now in common use consists of few parts, and is not subject to many faults. Chief among them is the liability of breaking diaphragms (if of carbon) and an effect called packing. The former is remedied by installing a new carbon disk, and the latter is made known by a general falling off in efficiency. It becomes necessary to speak louder and to get quite close to the mouthpiece. In some transmitters this effect is much more pronounced than in others, but all of them are more or less subject to it. Taken as a universal remedy it might be suggested that if new granulated carbon is placed in the microphone affected a beneficial result may be observed.

The induction coil, with its primary and secondary winding and its iron wire core, is a comparatively simple piece of apparatus. The part usually damaged is the secondary winding. Sometimes when roughly handled the primary winding is broken or crossed on the side of the core ends, in which case it is necessary to first unwind the secondary in order to repair the primary winding. In rare instances the secondary winding is burned out. When this occurs it may be taken for granted that other parts of the coil have received serious damage, and that it would not be worth while to purchase new wire for the secondary winding, when a new coil could be had for a trifling additional cost. The more com-

mon trouble, and one which can be repaired at practically no expense, is caused by discharges of currents having a very high difference of potential. As a rule the wire will be found broken near the outside, and it can be repaired without requiring specially constructed tools. If it is necessary, however, to unwind the coil, it must first be clamped fast by a pair of chucks or jigs, which fit the spool-heads. One jig should be fastened to a stationary center, and the remaining one to the driven head of a lathe spindle. Under no circumstances is it advisable to remove the core wire for the purpose of sliding the spool on a mandrel, as it is almost impossible to reinsert all of the core wire taken from a coil.

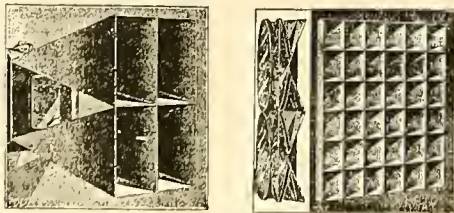
The bell magnets are constructed of an insulated



FIG. 2. LOUD-SPEAKING TELEPHONE.

iron core, with fiber-heads between which a certain quantity of wire is wound. One end of the core is provided with a tapped hole for the reception of a screw fastening into the frame. When it is necessary to repair a faulty ringer, first ascertain where the trouble lies, then, if the coil requires rewinding, remove it from the ringer-frame and screw it fast by means of the threaded hole mentioned to a threaded jig held in place by a chuck on the spindle of a coil-winding machine. The winding of a ringer coil is so simple an operation that it should never be necessary to return one to the factory for repair. In order to avoid delays it is advisable to keep a supply of fiber-coil ends constantly on hand, as a burned-out coil would probably mean a new set of heads. The polarizing magnet of a magnetic ringer is a magnetized bar, and calls for attention only on very rare occasions.

The magnetic generator is a more difficult piece of apparatus to keep in good working condition. The armature bearings wear out in course of time, and can not well be repaired. The gear wheels often are a source of annoyance, especially if the teeth of the larger wheel are very narrow, in which case the smaller wheel or pinion is quickly worn out where the driving gear engages it. Another troublesome point is the wearing off of the armature contact pin, but this wearing may be arrested by a special metal cap placed over the end of the pin. Usually, however, the fault is given no serious consideration until the pin is worn away entirely to the armature frame, when, of course, a new pin is required. This pin is not easily replaced and generally the armature must be returned to the factory for this purpose. The permanent magnets of a generator, if originally made of good material, will require no attention further than remagnetizing after a demagnetizing current accidentally passed through the armature winding. The armature windings of most generators may be taken off and replaced without much trouble, as one limb of the armature is provided with a tapped hole by which it may be fastened to a threaded jig, as was done with the bell coils. In preparing an armature for winding it should be carefully insulated with strips of cloth and paper. Before winding, a strong piece of twine should be laid across the center at right angles to the shaft on both sides of the armature and in such a way that after the wire has been wound on both limbs it may be kept from flying out and against the pole-pieces by tying both ends of the twine together over the wire. While speaking of fastening armatures to a winding chuck the writer failed to mention that recently an armature has been placed on the market wherein the threaded hole is not required, for the armature limbs are so constructed that in order to hold it a specially constructed clamp-



FIGS. 3 AND 4. LOUD-SPEAKING TELEPHONE.

must be secured from the manufacturer of that particular kind of apparatus.

The switching appliance of a subscriber's telephone requires no special treatment, as it can be kept in good working condition by anyone possessing an ordinary degree of mechanical ability.

Telephone In Hawaii.

Mr. John Cassidy, superintendent of the Mutual Telephone company of Honolulu, was in Chicago last week, looking over modern equipments for telephone exchanges. Mr. Cassidy is a native of Albany, N. Y., but he has been a resident of Honolulu 20 years, and is now very much attached to that country and its people. He says that the prospects for improved business conditions in Hawaii are exceedingly bright, and that the country is now enjoy-

ing a large measure of prosperity. Mr. Cassidy has been interested in the electrical development of the country, and was formerly identified with the electric-lighting interests. The telephone has a wide field of usefulness in Hawaii, and it is becoming more generally employed there every year.

Loud-speaking Telephone.

A telephone has been invented by a Frenchman, M. Germain, with which singing and speaking may be heard at a distance of 300 feet from the receiver, and which, when required, registers its message by means of an attached phonograph. The instrument is described by M. Leroy in La Nature, from which the accompanying illustrations have been reproduced.

Fig. 1 shows one of the principal devices adopted. In No. 1 is a general view of the transmitter, and in No. 2 a transverse section. In front there is an opening, in which are the ends of four small tubes that lead from the vibrating disks (A and B). These disks, made of silicate of potash and magnesia, are of special construction and vibrate with great ease. On them are fixed a series of small cylinders enclosing powdered charcoal.

This arrangement is based upon the principle of the microphone, and gives remarkable results with a certain intensity of current. When a person speaks in front of the transmitter there is heard from the receiver a loud and clear voice of good quality, not at all nasal. Even if the voice at the transmitter is very soft, that at the receiver continues to be loud.

The inventor uses also a second receiver (Fig. 2), consisting of a slightly conical tube, over two yards long, which is fixed against the wall and enables one to hear in the garden around his house. In the daytime the outside noises prevent, but in the evening, singing, music and the voice of a speaker can be heard 300 feet away from the receiver. Conversation in an ordinary tone can be heard 50 feet distant.

In the experiments just mentioned the inventor's first model has been used, with four-cell batteries.

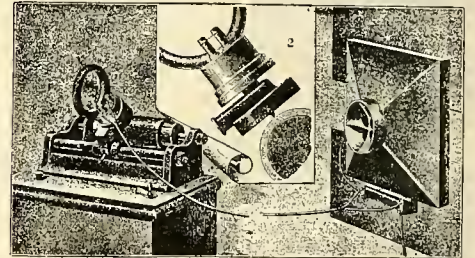


FIG. 5. LOUD-SPEAKING TELEPHONE.

There are also other models using six, 10, 15 and more elements, according to the desired intensity. For ordinary conversation the first model is sufficient. When a number of persons wish to hear at once, or to use the instrument in applications like the theatrophone, they may adopt other arrangements and choose higher current-intensities. Figs. 3 and 4 show transmitters that can be utilized in these applications.

M. Germain is also experimenting on a registering apparatus in which a phonograph is combined with the receiver. By this means a message is easily registered in the absence of a correspondent. Fig. 5 shows the chief arrangement. At the right (No. 3) is the transmitter, and at (No. 1) the receiver is shown mounted on the phonograph. As the detail in No. 2 shows, the receiver carries a tube that connects its orifice to the vibrating-plate of the phonograph. These experiments in registration are very interesting, and have succeeded very well. The conversation is heard clearly while it is being registered.

M. Germain's latest instrument, in which the transmitter may be held in the hollow of the hand, was exhibited in Paris, on March 17th, before the French cabinet. "Songs and instrumental music were heard clearly in all parts of the grounds of the Departments of Commerce on the Rue de Grenelle and of Agriculture on the Rue de Varenne, notwithstanding all the noises of the city," it is claimed.

Telephone in the South.

[Special correspondence of the Western Electrician.]

A. J. Cottess is putting in a small exchange at Iuka, Miss.

The citizens of Martin, Tenn., have contracted for a 200-number switchboard and the necessary telephones, in opposition to the Cumberland Telephone and Telegraph company, whose rates proved too high for them.

C. W. Bolton has about completed his lines to Middleton, Tenn. This gives him also one line from Pontotoc, Miss., to Middleton, Tenn., along the line of the Gulf and Chicago railway, with branches to interior towns.

The Arkansas and Tennessee company is extending its lines from Barfield and Osceola, Ark., up the west bank of the Mississippi River to Gayoso, Mo. W. J. R.

Mattoon's New Exchange Equipment.

The Mattoon Telephone company occupies a unique position among the larger independent exchanges of Illinois, in that it has an exclusive territory and has thus far succeeded in keeping the Bell interests out of the field, although it is one of the most important points in the state, and has developed into an excellent city for a telephone system. Dr. J. A. Lumpkin, who organized the company and personally directed its policy since the inception of the movement, has endeavored to make it a model plant, and his efforts have been appreciated by the people of Mattoon and the independent telephone managers of the state. He has developed the business in four years into one of the best independent plants in the state, extending the service and improving the equipment as fast as the demands of patrons warranted. The company is now installing a 500-drop metallic switchboard, manufactured by the Sterling Electric company of Chicago, and illustrated in the accompanying cut. Other improvements in keeping with the character of this equipment are being made. The new service will be given early in July, it is thought.

A brief outline of the company's growth will be interesting at this time, showing, as it does, what can be accomplished in this field by well-directed effort, intelligent and conservative management.

The Mattoon Telephone company was licensed as a corporation with a capital stock of \$10,000, in October, 1894. Construction was begun with a list of 80 subscribers the first of January, 1895, and the plant began operation with 120 subscribers on April 20th, the same year. It was at that time the second

tal stock to \$25,000, to provide for the improvements and extensions demanded by the growth of the business. The present management, which, by the way, is the same as the original organization, comprises the following named officers and directors:

President, Dr. J. A. Lumpkin; vice-president, C. E. Wilson; secretary and manager, John W. Gay; treasurer, Dr. W. C. Lumpkin. Directors, J. A. Lumpkin, W. C. Lumpkin, C. E. Wilson, L. L. Lehman, G. N. Buck and J. W. Bledsoe. Dr. Lumpkin is widely and favorably known in the independent telephone movement. He is president of the Illinois Telephone association and a director from this state in the National association.

The secretary and manager of the company, Mr. Gay, feels proud of the fact that he suggested the idea of the formation of a telephone company at Mattoon, and afterward interested Dr. Lumpkin, and that they have carried through the first company of any size in the state which has neither had financial troubles nor internal dissensions.

The vice-president of the company, Mr. Wilson, is president of the Mattoon National Bank, and among the directors, Mr. L. L. Lehman is president of the First National Bank, and George N. Buck is the leading retail dry goods merchant of that part of the state. It will be appreciated, therefore, that the enterprise has substantial and influential support. As mentioned before, there is no Bell exchange located at Mattoon, but the Bell interests have repeatedly tried to get a franchise. The citizens at Mattoon, however, are thoroughly satisfied with the superiority of the service given by the Mattoon Telephone company, and do not take kindly to the

system to central energy here, making it, of course, depending it borrowed money as far as possible.

Illinois Telephone Association.

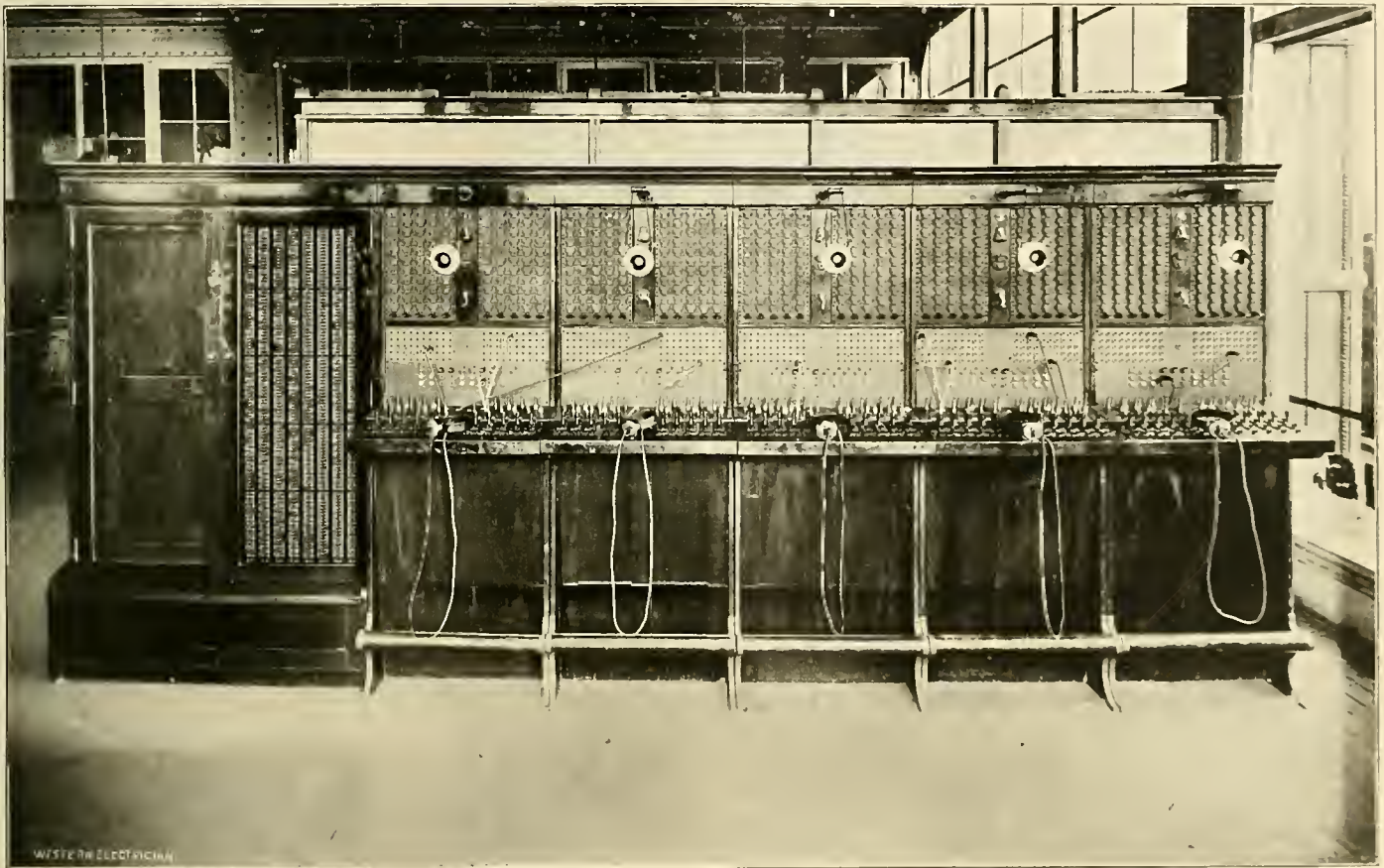
Dr. J. A. Lumpkin, the president of the Illinois Telephone association, was in Chicago last week. He said that he expected a large attendance of exchange managers from all parts of the state at the meeting of the Independent Telephone association in Chicago next week, and he hoped that the meeting would help the local organization. He has sent out the following notice to the owners of independent telephone exchanges and toll lines in the state of Illinois:

"The National Independent Telephone association meets in Chicago the 26th, 27th and 28th of this month, at the Auditorium Hotel. The meeting bids fair to be a grand success and a grand good time awaits those who attend. I should like to see a large delegation of Illinois representatives at that meeting. Those who do attend will be called together some time during the meeting to determine whether or not they desire to keep up our state organization or disband. Your presence in Chicago will indicate how you feel in this matter and determine the future of the Illinois State association."

Colonel Astor's Telephone System.

[From the Saturday Evening Post.]

There are many sides to the character of Colonel John Jacob Astor, by all odds the richest soldier in our late war. Since the death of his father he has been indefatigable in his attention to business. Not



MATTOON'S NEW EXCHANGE EQUIPMENT.—500 DROP SWITCHBOARD.

independent plant to be established in the state of Illinois on what was then considered a large scale. The original capacity was for 150 subscribers, which was considered sufficient for all requirements; but the success of the company was so great that, although no solicitation for telephones has been made at any time since the original list was secured, there has been no time since the start that all orders were filled, and at the beginning of the present year the company had 400 telephones in operation.

This constant growth made many changes and additions to the original plant necessary, but it was determined to wait until the maximum demand could be fairly calculated before undertaking a complete installation upon modern lines. The first exchange was a common-return system, and this plan was followed in making the additions necessary in the development and extension of the service.

Now, however, in addition to the new exchange equipment, the company is rebuilding its lines, putting in new cables on the main leads and converting the entire plant into a complete metallic system. The headquarters for the company will be moved into the second floor of the new Demaree building, where three rooms have been arranged especially for this purpose. The new 500-drop switchboard will be installed there by the Sterling company, together with the cable terminals, protective devices and distributing boards furnished by the same company. The Mattoon company recently increased its capi-

interest of the Bell company in their city, and they have rejected all petitions for privileges in that city. It is generally recognized that as long as the company is in control of the present management and the service continues as satisfactory as at present there will be no place for the Bell system in Mattoon.

Telephone War in Lee County.

The Lee County Telephone company of Dixon, Ill., has been engaged in a lively war with the Central Union Telephone company, and thus far the independent company has managed to make material gains upon the Bell forces. L. D. Pitcher, the president and general manager of the Lee County Telephone company, seems to enjoy the excitement. He says:

"I am pleased to say that we have only had two subscribers go back on us and take a 50-cent telephone of the Central Union company in place of ours at the regular \$1.50 rate, and that we have put in about 20 new instruments in the same time—so we don't seem to kill as easy as they expected.

"We are now building a line from Harmon to Stone, and next week will build a line from Paw Paw to Earlville and put in an exchange there with 40 subscribers. We are also now connected with Shabbonie, Somanank and Sycamore, DeKalb County. The Central Union company is changing its

only his large estate, but his outside investments receive his most watchful care. He carries this system into his home life.

Colonel Astor has a splendid estate up the Hudson, called Rhinecliff. It is a model place in a region noted for summer homes. It is cared for by an army of employes, but Colonel Astor is always the commanding officer. Just after his return from Cuba he described to a friend how he conducted it.

"I run it," he said, "on a business basis. Each department has a responsible head. There is a chief dairyman, chief stableman, chief gardener, farm superintendent and general superintendent. I have a report in writing from each division head on my desk every morning. I can tell each day just what has gone on and precisely what is under way. Every month my accounts are balanced, and I know how I stand just as if I ran a grocery store instead of a country place.

"In addition to that, I have a complete telephone system that enables me to communicate within 15 minutes with every man on the place. I have a central office, and branches in all the important buildings. Besides that, I have boxes, like police telephone stations, scattered at regular intervals along my 40 miles of roads.

"Suppose I want to find out at 10 o'clock on a morning just what each gang of road repairers is doing. I ring up the various boxes, and in a quarter of an hour I have a report from every squad."

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CORRESPONDENCE relating to electricity or any of its practical applications is cordially invited, and the co-operation of all electrical thinkers and workers earnestly desired. Clear, concise, well written articles are especially welcome; and communications, views, news items, local newspaper clippings, or any information likely to interest electricians, will be thankfully received and cheerfully acknowledged.

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CONVENTIONS AND EXPOSITIONS.

- International Electrical Exposition in Commemoration of Volta, Como, Italy, May 20th to October 25th. (The date of the festival of the centenary of Volta at Como is fixed for September 18th.)
- American Institute of Electrical Engineers, Boston, June 26th to 29th.
- American Society of Civil Engineers, Stockton Hotel, Cape May, N. J., June 27th to 30th.
- Canadian Electrical Association, Hamilton, Ont., June 28th to 30th.
- Southern Telephone Association, Memphis, Tenn., July 5th.
- American Association for the Advancement of Science, Columbus, O., August 21st to 25th.
- International Meteorological Committee, St. Petersburg, August 25th.
- National Association of Municipal Electricians, Wilmington, Del., September 5th and 6th.
- Philadelphia Exposition of American Manufacturers for Export, September 14th to November 30th. (Under the auspices of the Philadelphia Commercial Museum and the Franklin Institute.)
- American Electro-therapeutic Association, Willard's Hotel, Washington, D. C., September 17th to 21st.
- Chicago Exposition of Electrical Arts, Tattersall's, September 25th to October 9th.
- International Exhibition of Motor-vehicles, Berlin, Germany, during September.
- American Street Railway Association, Tattersall's, Chicago, October 17th to 22th.

It is gratifying to note that a fine marble statue of von Helmholtz has been erected in Berlin, the city in which so much of his work was performed. Professor von Helmholtz was a true scientific investigator, and of the first rank. American cities have memorials of Goethe, Schiller, Humboldt, Bismarck and other German celebrities—why not one of the great physicist also?

Chicago park commissioners, after making themselves ridiculous in the eyes of the community by passing a rule prohibiting the operation of automobiles upon the boulevards and in the parks, have finally yielded to public opinion and allowed the objectionable order to be regarded as a dead letter. The commissioners based their objections to the automobiles on the ground that unless they were operated by experienced men they might injure persons using the parks as a pleasure ground, and that they frightened horses.

It is gratifying to find such evidence of the efficiency of the present administration of the Patent Office as that given in the list of patents presented every week. Among the patents issued on June 13th was one for which application was filed on May 1st. It is evident that the provision made by Congress for improving the service and increasing the force of the Patent Office was a wise measure, and that the appropriation has been judiciously expended. We extend our congratulations to Commissioner Duell, and assure him that the inventors of the country appreciate the efforts he is making.

Keeping in mind the criticism of the Western Electrician upon the failure of the makers of automobiles to design original and attractive vehicles, the following excerpt of an editorial in the Chicago Tribune is interesting at this time:

Nothing could be more stiff or ugly than the horseless carriage in its ridiculous aping of the horse carriage. Its lack of individuality represents that loss of creative imagination, and hence that divorce of beauty from utility, which characterizes our industrial age.

It has been announced in the daily newspapers that the company controlling the business in Chicago would put 200 vehicles into service within a short time. This statement is probably exaggerated, but it is a fact, nevertheless, that a serious attempt is being made to get a large number of these conveyances into public use this season. It is to be hoped that some departure will be made from the old styles thus far adhered to, and that some artistic and graceful carriages will be produced.

An effort will be made at the Chicago meeting of the Independent Telephone association to revive interest in the state organizations and secure a more perfect union of local operating companies, in order that they may resist the aggressions of the Bell companies. In Illinois, for example, it has been found difficult to secure co-operation among exchange managers, not because of any lack of harmony, but simply through indifference to the advantages of a strong state organization. A few local operating companies have lately felt the necessity of such an association, and it is quite probable that they will now support the movement earnestly and inspire their neighbors with a wholesome regard for its influence. Dr. Lumpkin, the president of the Illinois association, has urged the members to attend the meeting of the national organization in Chicago next week, and he has suggested a conference of the local interests at the same time, with the view of determining upon a policy for the approaching contest. The experience of other state organizations, which will be represented in the Chicago gathering, has been so beneficial to the industry that it is believed their influence will tend to arouse the Illinois delegation to a realization of the benefits which closer association will bring.

At last steps have been taken to protect foreign inventors and manufacturers who contemplate exhibiting at Paris next year against the industrial pirates who have heretofore taken advantage of the French patent law, which is understood by so few Americans. The Paris correspondent of the Western Electrician furnishes the following interesting statement upon this subject:

M. Paul Delombre, the minister of commerce and

industry, has brought before the French Chambre des Deputes a bill relating to the protection of industrial property, and especially to articles admitted to the exposition of 1900. The law of July, 1844, prohibits under penalty of annulment the introduction into France of patented articles, and also pronounces the penalty of annulment against the patentees who allow two years to pass without exploiting their inventions in France. The same rule holds good to a certain extent in the case of designs. The bill proposed by M. Delombre is to allow the patentee to introduce into France articles to be exhibited, and suspends the obligation to exploit these inventions during the whole period of the exposition. Besides this bill, inventors will be protected by the statute of May, 1868, providing that every person, native or foreigner, who is the originator of a discovery or invention susceptible of being patented may, if he is admitted to one of the government expositions, obtain a certificate describing his invention, which insures him protection from the date of admission until the end of the third month after the exposition, giving him for this space of time the same rights as if he held a patent in due form. By this statute and the bill proposed by M. Delombre, inventors wishing to exhibit in 1900 may be assured of full protection.

Attention has been directed to this subject several times by this journal, and it has been pointed out that Americans who contemplate exploiting their products abroad should learn the requirements of the French and German laws particularly. In both of these countries American inventions have been openly appropriated under technicalities and no redress could be had by the sufferer.

It seems that the theft of electricity is no crime at present in Germany, there being no express law against it. In December last the Provincial Court at Elberfeld sentenced three mechanics each to one day's imprisonment for stealing electricity. The men had secretly attached wires to a circuit in the house where they lodged, and thus got their room lighted by electricity for nothing. The court decided that electricity possessed the essential properties of a movable object, but this was appealed against, and the case has finally reached the Senate of the Supreme Court of the Empire. The Senate holds that the judgment of the Provincial Court must be quashed, for the reason that those properties are wanting in electricity which would be necessary to constitute it a movable object in the sense of the law. In the sentence it is stated that electricity must be reckoned as one of the energies of nature, like sound, light and heat. As the law provides only against theft of movable bodies, it is inapplicable in the case. Damage to property can also not be pleaded, for this requires that the substance of the object must be affected. It cannot again be said that a property has been withdrawn from the wire, for electricity is not one of the properties of copper wire. The Senate came to the unanimous conclusion that, with the law in its present state, tapping an electric current is not theft.

In extending a welcome to the independent telephone men about to assemble in this city, the Western Electrician desires to congratulate them upon the important change they have made in their method of conducting their meetings, and assure them of its earnest support and assistance in making the convention of permanent benefit to the industry. This journal has advocated open meetings of the association, and has repeatedly pointed out the benefits to be derived from arousing public interest in these gatherings. Secret meetings of organizations representing interests depending largely upon public franchises are always dangerous to the associations holding them, as they create and foster distrust in the public mind—a very serious evil of itself and one which contributes largely to the failure of many enterprises of a public nature. The arrangements for entertaining the visitors this year are on a scale commensurate with the character of the industry, and this feature should prove advantageous. There are many points where the association may be improved, so that exchange managers may get some real benefit from it during the year. An active organization or bureau to furnish data to exchange managers who are fighting the Bell system and a systematic canvass for new members are features that might well be introduced during the coming year. The association should broaden out and take an active part in the development of the industry.

Telephone Service at Paris Exposition.

[Special Correspondence of the Western Electrician.]

Paris, June 15.—[Preparations are now being made to provide the necessary telephone service for the exposition which, it is expected, will assume considerable proportions, as the number of subscribers among the exhibitors is estimated at 2,000. A special system will not be installed in the grounds, as at Chicago, but a large central station is to be erected on government property near the grounds, on Avenue de Saxe. This station will not only supply the exposition, but the whole of the surrounding district, being, in fact, one of the numerous stations forming part of the existing system of city distribution, the whole of which is under control of the government. This district is for the present taken care of by two of the neighboring stations, while waiting for the new one to be erected. The minister of commerce, who has the matter in charge, is to push matters as rapidly as possible, in order to have the new station built and equipped in time for the exposition, which will open in the month of May.

It is probable that Paris will shortly have a telephone line to Berlin, by which conversation may be held directly between the two cities, thus doing away with any intermediate connection. This line has been greatly needed, and will doubtless give good service. Its construction has been delayed for some time, owing to the differences between the two governments; but, as the project has now been approved by the German government, there is no doubt that it will also be accepted in France. The line will be of double silicon bronze wire, five millimeters in diameter, and is, in fact, one of the longest lines constructed in Europe up to this time. Another similar line is to extend from Paris to Frankfort, and as Berlin and Frankfort are already connected, the joining of these two lines will give a second connection from Paris to Berlin. These projects will be carried out immediately after the consent of the French government is obtained.

A new system of telephone communication has lately been put in practice, by which a message may be sent from one of the public telephone stations to any address desired. The message is taken down by the employe at one of the other stations nearest the residence of the person to receive it, and is delivered by a special messenger boy, somewhat after the manner of the special-delivery system. This is made easy on account of the large number of telephone stations in Paris, these being installed in the branch postoffices, which are scattered all over the city. To communicate with a subscriber in the ordinary way a ticket, costing five cents, is procured at the telegraph window, and given to the attendant, who calls up the subscriber, after which one enters the telephone box and may hold a three-minute conversation, after which an additional rate is required. The new system recently organized provides for the more numerous cases where the person to be reached is not a subscriber; however, the rate is higher, being ten cents for the delivery of the message to the residence. Besides the telephone communication between the different postoffices, there has existed for a long time the system of "cartes-telegraphes," by which a message written on a special card or letter-sheet is sent from one office to another by pneumatic tube, and delivered at once to the address desired. This system has proved very satisfactory, and is largely used; the rate for an open card is six cents, and for a sealed letter-sheet ten cents. It is expected that this system will be replaced to some extent by the new arrangement for the delivery of telephone messages, as one has the advantage of being able to call the other person to the telephone, if desired. F. P. M.

Bell Interests in Michigan.

The Michigan Telephone company has decided to build a \$10,000 addition to its operating rooms in Detroit. The new building will be used for a warehouse.

Under startling headlines the Detroit Free Press of June 17th announces an opportunity for inventors: "President Charles J. Glidden of the Michigan Telephone company telegraphed the Free Press from Cleveland yesterday concerning a statement recently made, that he will pay \$1,000,000 for a telephone repeater or quadruplex used in connection with a telephone, which will produce, technically speaking, the same results that the telegraph quadruplex does to-day in the workings of the telegraph. Mr. Glidden is president of the Erie telephone system, which operates under the Bell patents, with 82,000 subscribers in Michigan, Wisconsin, Minnesota, North and South Dakota, Cleveland, Texas and Arkansas. The companies included in this system operate a great many long-distance lines, and are now engaged in extending their systems to many new points, as well as doubling the facilities on existing lines. The class of construction work done is of a very high order, and as nothing but copper wire is used, the investment runs into the hundreds of thousands very fast. Up to the present time, no satisfactory quadruplex, or repeater, for telephone purposes has been devised, and not more than one conversation can be held over a pair of wires at one time. The offer of \$1,000,000 for a satisfactory telephone quadruplex will doubtless have the effect of stimulating electrical experts in their work along this line."

The Michigan Telephone company's new long-distance circuits between Detroit and Kalamazoo will be completed within a very short time, it is said, and it is expected that the circuits will be completed as far as Jackson within ten days or two weeks. The lines through to Marshall will be ready by July 1st. In the construction of these new long-distance lines, the Michigan Telephone company is using nothing but first-class material and nothing but copper wire is being strung. The Detroit-Kalamazoo line involves the use of 5,400 poles, 12,400 cross arms, 124,000 pins and 124,600 insulators, and a total of 315,850 pounds of copper wire is used for this line. The Marshall Statesman of June 16th says: "Possibly the telephone company will soon have an exchange list, so that by July 1st subscribers may also be able to know with whom they may talk."

Helmholtz's Monument.

The accompanying illustration represents the statue erected to the memory of von Helmholtz at Berlin, which was unveiled in the University Garden June 6th. It represents the mathematician and physicist in the attitude so familiar to his former pupils, the professor's mantle being thrown over his frock. The likeness is said to be as nearly perfect as the nature of the material permits. White Tyrolense marble was selected by the artist, Ernst Herter, for the statue, and red Franconian marble for the pedestal. The cost of the work amounted to \$25,000, of which the emperor contributed \$4,000.



HELMHOLTZ'S MONUMENT.

The inscription is simply, "Herman von Helmholtz, 1821-1894."

Growth of Telephone Service.

Charles J. Glidden of Lowell, Mass., president of the Erie telephone system, while in New York recently was interviewed by a Tribune reporter and presented some interesting data upon the development of the telephone as a commercial factor.

"The telephone business in the United States," said Mr. Glidden, "is increasing at a rate which exceeds anything in its history. The subscribers of the Erie system alone are increasing 4,000 a month. I know of no other reason for this remarkable growth than the general business revival throughout the country. I have noticed, however, that the greatest development is along the Pacific Coast, in Washington, Oregon and California. Four per cent. of the population there have telephones. In proportion to its size San Francisco has more telephones than any other city in the United States. It has over 14,000 instruments, which is five per cent. of its population. On this basis New York should have 150,000 instruments."

"The long-distance service now reaches to Galveston, Tex., in the Southwest; Grafton, N. D., in the Northwest; New Orleans in the South, and the extreme northeastern sections of Maine. The extreme points have not yet been put into commercial connection with each other, the direct use at present being confined to distances of 1,500 and 1,800 miles. I think the capacity of the No. 8 copper metallic circuits, now in use, is about 2,000. A circuit which would permit of a direct connection between here and San Francisco would require copper wire at least as large as an ordinary broom handle."

"In the present circumstances I cannot see where there is room for any phenomenal developments in the telephone system. Now, if someone would invent a telephone repeater, corresponding to the telegraph repeater, or a telephone quadruplex, corresponding to the telegraph quadruplex, it would revolutionize our business and cut the charges in two for long-distance service. Copper wires would not be necessary then, and the reduction of the cost of maintaining the lines would be enormous. I will give \$1,000,000 for either one of these inventions."

Telephony in New England.

[Special correspondence of the Western Electrician.]

Boston, Mass., June 19.—The readjustment of affairs that is under way in the Bell telephone interests is preparing the public for the transfer of control to the American Telephone and Telegraph company, which has been contemplated, it is understood, for quite a while, under the recent increase of capital stock in the latter corporation from \$25,000,000 to \$75,000,000. Rumors have been current lately in Boston to the effect that the Erie syndicate had bought the New England Telephone company. Nothing of the sort was broached at the annual meeting of the Erie, however, and President Glidden of the Erie and Hudson of the New England could shed no light on the subject. It seems more probable that the real project in prospect is the transfer by the American Bell company of its holdings in dependent companies to the American Telephone and Telegraph company, the better to carry on the growing business of these concerns.

The board of health in Boston has caused a number of telephone transmitters in hotels and public buildings to be examined microscopically by an expert bacteriologist, and resulting in the discovery that they were singularly free from harmful bacilli. Dr. Hill, the examiner, declared that the telephone transmitter cannot be considered a usual or dangerous source of disease. He admitted possibility of infection where a user of the transmitter is affected with diphtheria, tuberculosis or other contagious disease, and where a deposit of saliva is left on the transmitter by coughing or in some other manner. Infection from expired air of breathing he looks upon as hardly probable or even possible. Frequent cleansing of transmitters is recommended, however, for aesthetic reasons, and he suggests washing them with a one per cent. solution of formalin or five per cent. solution of carbolic acid. He asserted that as a rule "there are not in telephone transmitters microbes of any more dangerous nature than are to be found daily in the water we drink or the air we breathe."

The Massachusetts Telephone and Telegraph company (anti-Bell) has just secured franchises in Lawrence, Mass., and Waltham, Mass. Negotiations have also been opened with New Bedford for the right to do business there.

The New England Telephone and Telegraph company has bought an estate on Norman street, Salem, Mass., for a central telephone station, and will raze the old structure, to replace it with an edifice perfectly equipped for the business. The company has been seeking a suitable property for the purpose upward of a year. The company has also secured within a few days an estate in Boston in the North End district, at a cost of upward of \$25,000, most of the valuation being on the land.

At the annual meeting of the Erie Telephone and Telegraph company on June 14th the following board of directors was elected: John C. Burke, Lowell, Mass.; A. B. Chandler, New York; Charles J. Glidden, Lowell, Mass.; Wesley A. Gove, East Boston, Mass.; David S. Greenough, Boston, Mass.; James H. Mills, Lowell, Mass.; James W. C. Pickering, Lowell, Mass.; Asa C. Russell, Lowell, Mass.; Levi Sprague, Lowell, Mass.; H. Fred Stevens, New York; Charles S. Tuckerman, Boston, Mass.; Harvey A. Whiting, Wilton, N. H. The board was organized by the election of Charles J. Glidden, president; George B. Perham, secretary, and Charles A. Grant, treasurer.

Before Judge Colt, in the United States Circuit Court, in this city, the hearing in the final stage on the matter of an accounting from the Bell Telephone company to the Western Union Telegraph company has been in progress, and on June 15th the judge took the papers and documents in the case under advisement, reserving decision to be announced later. This is the big legal contest which has been on since 1883, litigation growing out of the interpretation of the terms of a contract made November 10, 1879, whereby the Western Union Telegraph company ceded the telephone business under its control at that time to the telephone company for certain rentals or royalties. It is set forth by the plaintiffs that after the contract was made the telephone company changed its method of conducting business, so that in addition to specific rentals the defendants received from licensed companies a certain percentage of stock in the licensed corporations, for the use of telephones under its patents. It is 20 per cent. of the stocks so received that the plaintiffs seek to secure. The late Judge Lowell, acting as a master, found for the defendants in the matter, and the Western Union company seeks to have his findings superseded by the court on exceptions. Several millions of dollars are involved in the decision.

From Hartford comes the announcement that on June 13th the lower house of the state Legislature refused by a large majority to grant the petition of the New York and Boston Telephone company for an incorporation in the state. The company made a proposition to give free telephone service to the state and to cities which it entered, and agreed that its rates should not exceed \$50 a year to business houses and \$30 a year to residences. It also agreed to accept amendments to the proposed charter which would prevent its consolidation with any other company, unless the absorbing company should agree to keep the rates as low as \$50 and \$30 a year, and further, that unless all of the capital stock of the company should be paid in within 90

days of incorporation the charter should be null and void.

This action of the Connecticut Legislature was foreshadowed in an adverse report on the petition from the committee to which it was referred. The Massachusetts Telephone and Telegraph company, which has begun to lay its conduits and establish the service for Boston and vicinity to compete with the Bell companies, had hoped to connect with New York via Connecticut, and the New York and Boston Telephone company was to have been the long-distance backbone of the system. The setback is something of a blow to the new enterprise, but work on the Boston and suburban circuits will be pushed just the same. The company has already secured upward of 3,000 subscribers in Boston. J. S. B.

Eureka Electric Company's Factory.

In the accompanying illustration is shown a view of the switchboard department of the Eureka Electric company's factory, which is located at McCordsville, Ind. It is said to be one of the best-equipped telephone manufactories, and contains nothing but the latest high-grade machinery, which enables the Eureka company to turn out only work of the highest degree. The company keeps constantly employed about 100 hands, and at the present time is obliged to keep its force working day and night to meet the demand for the Eureka switchboards and other Eureka products. The Eureka metallic switchboard, like the company's telephone, is in no way behind its competitors. It is said to be rapid in operation, simple in construction, economical in maintenance, while its accessibility is one of its leading features. It is claimed that each drop and jack is self-contained, and can be removed and replaced in less than 30 seconds by anyone without disturbing a single line connection and without the use of a tool. The switchboard, it is claimed, possesses many other points of superiority. The Eureka company says that its apparatus is now in service in over 300 prosperous telephone exchanges, and is said to be giving the best of satisfaction. The company is now equipped to manufacture telephone apparatus to meet any special requirement. The success of the company has been remarkable, due, no doubt, to the untiring efforts of Messrs. Kusel and Stein. The company will exhibit its apparatus during the Independent Telephone association convention, where those who desire to look further into the merits of the Eureka apparatus will be given an excellent opportunity to do so.

Southern Telephone Association.

There will be a meeting of independent telephone men at Memphis, Tenn., on July 4th and 5th. The

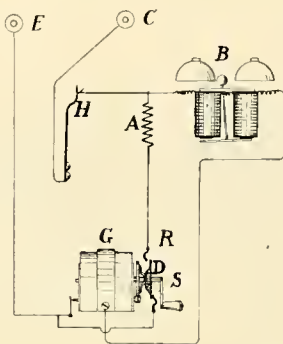
was effected, and the following officers elected: President, James D. Randall, Memphis, Tenn.; secretary, C. W. Bolton, Pontotoc, Miss.; treasurer, George W. Scheuing, Memphis, Tenn.

It is proposed that each exchange owner or manager in the South be requested to furnish the association a map of lines and such data so that a map and directory of the telephone business of the South can be made, showing the various telephone lines now built, or under construction, with a view to pointing out all unoccupied territory and gaps which could be filled in to advantage, and give better and more profitable service by operating together. There is much territory which is not now occupied by telegraph or telephone lines, and it is believed that by working together these gaps can be filled in, new lines built and the telephone service in the South greatly improved and a better understanding exist between the several companies.

Carty Patent and Independent Exchanges.

By H. C. DODGE.

The recent decision by the United States Circuit Court of Appeals, upholding the validity of the Carty bridging-bell patent, the full text of which was

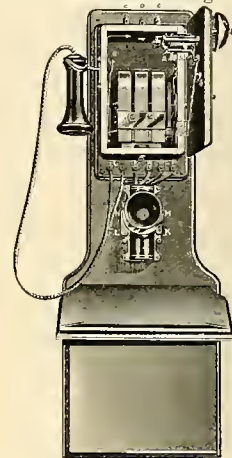


FIGS. 1 AND 2. CARTY PATENT AND INDEPENDENT EXCHANGES.

presented in the Western Electrician last week, will not result in precluding the lawful use of bridging-bell telephones in connection with party lines by operators of anti-Bell toll lines in this country, and the decision in question is of no considerable importance to operating telephone companies, inasmuch as they can procure for use in the open market

combination, which Mr. Carty in his deposition admits necessarily involves the permanent bridging of the bell magnets, and does not cover and is not infringed by a device in which the bell magnets are not always in bridge.

The patents urged against the validity of the Carty patent showed that the bell magnets had been permanently bridged, as the Black & Rosebrugh patent described the call-bell magnet as connected by wires to the line and showed it as permanently bridged between two of the binding posts, and the Preece & Maier publication described the bell as "joined between A and B lines respectively at five and four." Mr. Carty himself in his deposition admitted that ringer magnets had been bridged between the two sides of the lines before his invention. It was urged by Mr. Carty's counsel that the permanent bridging of the bell magnets prevented the voice currents from becoming short-circuited by reason of the high resistance of the magnets. This objection was obviated in the Preece & Maier publication by having the electromagnetic inertia of the magnets "choke the circuit across the bridge," which likewise prevented short-circuiting. The electro-



magnetic inertia of the Preece & Maier bell magnets was admitted by the court to be the same thing as the high co-efficient of self-induction of the Carty magnets, each preventing the short-circuiting of the talking currents. Likewise, patents to Mr. Lockwood, the Bell company's well-known expert, and to Mr. Thompson show that it had been the practice to provide devices to block a loop or bridge against rapidly fluctuating voice-currents, while allowing the steady flow of the battery currents. Mr. Thompson says in his patent, by inserting in the loop or bridge "an electromagnet constructed with a large number of turns of wire surrounding an iron core, to insure the required co-efficient of self-induction, will plug the loop with its great electric inertia with respect to the rapidly fluctuating telephonic currents." Thus the very means that Mr. Carty had employed were shown to be old in the art for identically the same purpose, and with these facts admitted upon the record the court was unable to find that Mr. Carty had evolved any new arrangement of parts or discovered any new methods of preventing short-circuiting of the voice-currents, but contented itself with holding that as all of the elements were old and all of their functions were known, the patent could be sustained only on the ground that the bringing together of these various elements as specifically combined by Mr. Carty was sufficient to sustain his patent because, as the court said:

The grant of the patent carries with it the presumption of patentability, and this presumption has been strengthened by the general acceptance of the device, the acquiescence of those skilled in the art, and their willingness to accept licenses thereunder.

The patent was thus given the very limited construction of covering apparatus in which the bells are permanently bridged and as being specifically limited to such apparatus. It is not given a broad construction as covering all apparatus in which the bell magnets are merely normally or temporarily bridged as distinguished from permanently bridged, but is distinctly limited to an apparatus having the bell magnets in permanent bridge.

At the argument of the case Mr. Carty's counsel urged that the effect of the permanent bridging of the bells was to produce electrical balancing of the line, thereby reducing the annoyance of induction to a minimum. It is well known to all electricians that the mere placing of the bell magnets in permanent bridge will not produce this condition. Each wire of the circuit must have as nearly as possible the same resistance, insulation and electrostatic capacity as the other, which means that the two wires of the circuit should be of the same material, diameter and length, and should be carefully insulated and carried on the same poles and even on the same cross-arms. Moreover, not only must the electrical qualities of each wire of a metallic circuit be alike, but the electrical conditions produced by neighboring wires must also affect each wire equally; in other words, the relative exposure of each side of the circuit to sources of induction must be the same. This condition is usually produced by transposing the two wires of a circuit at certain poles along the line, so that for alternate stretches each wire



EUREKA ELECTRIC COMPANY'S FACTORY.

banquet hall of the Peabody Hotel has been secured for holding the business session, and the parlors of the hotel will be available for showing apparatus.

The meeting is to be held under the auspices of the temporary organization formed at Memphis on February 14th, by owners and managers of independent telephone lines and exchanges in the South. At that meeting it was decided to ask all persons interested in the telephone business in the South to co-operate, with a view to holding a convention at some convenient place during the summer, for the purpose of permanently organizing and adopting suitable rules and regulations for the government of the association. The name adopted for the present is the Southern Telephone association.

At the spring meeting a temporary organization

highly efficient non-infringing bridge-type telephones. The claims of the Carty patent in question, which the court has held to be valid, cover all forms of telephones permanently bridged in the line; that is to say, where two or more telephones are in use. The decision of the court upon the patent limits its application to an apparatus in which the bell magnets are permanently bridged. It was urged at the hearing by the counsel for the defendants, Josiah McRoberts, that all of the elements employed by Mr. Carty were old and that their functions were well known. The court concedes the truth of this position and says:

All of the elements of the combination had been used before and the functions of each were well known in the art, but it does not appear that they had ever been similarly specifically combined for effectuating the purpose here accomplished.

Hence, the patent was upheld for the specific com-

takes the place of the other, and so that each wire shall be in turn exposed to the sources of induction. Now, unless this condition exists, the employment of Mr. Carty's permanently bridged bells will not even have a tendency to produce electrical balance of the line, because without this transposition of the two wires of the line only one of the wires will be exposed to the source of induction and affected by it. The fallacy of the assertion that the Carty device of itself produces a balancing of the line is apparent.

The expert who testified that the apparatus of the Millheim Telephone company, which was the defendant, was constructed according to the principles

precipitated by users generally. In making the change from bridging to series remove the shunt coil (A) and change the ringer coils (B), substituting the low-wound series style. For series service the armature is wound for use with series or low-resistance ringers to be employed; for bridging work the armature is wound for use in connection with bridging bells to be used.

When the generator is operated, the disk (D) automatically breaks the shunt circuit at (S) and makes contact with the spring (R), thus causing the electric current to flow through the coil (A), contact (H), and to line through the binding-post (C). The disk (D) and generator (G) are in electrical connection; therefore, while operating the generator, the coil (A) and ringer magnets (B) each conduct a certain amount of the current. In practice the coil (A) conducts about 95 per cent. and the ringer magnets (B) five per cent., which latter quantity is just enough to gently sound the local bells.

Burns Sneak-current Arrester.

The Burns sneak-current arrester, manufactured by the Northwestern Telephone Manufacturing company, is built on entirely new lines, and is both

cut by a weak current and operated by a standard (Fig. 2) with carbon and porcelain contact test for 50 metallic line. The arrester may be mounted on iron cable terminals, complete with carbon arrester, and also singly for the protection of station instruments.

Interior Telephone System.

An interesting equipment for private use was recently installed in the new University Club, Fifth fourth street and Fifth avenue, New York, by the Schmidt & Bruckner Electric company of that city.

The system is of the automatic-signal type. The act of taking the receiver off the hook throws the line drop at the switchboard, and on replacing the clearing-out drop falls. The operator cannot restore the line drop until the plug is inserted in the correct jack or the clearing-out drop until the plug is withdrawn. Central batteries are used for talking and ringing purposes. The induction coils are also centralized. The switchboard is shown in Fig. 1.

At each of the bedrooms and parlors is located a small, white enameled box, on which is mounted a buzzer and a small stationary hook. The telephone

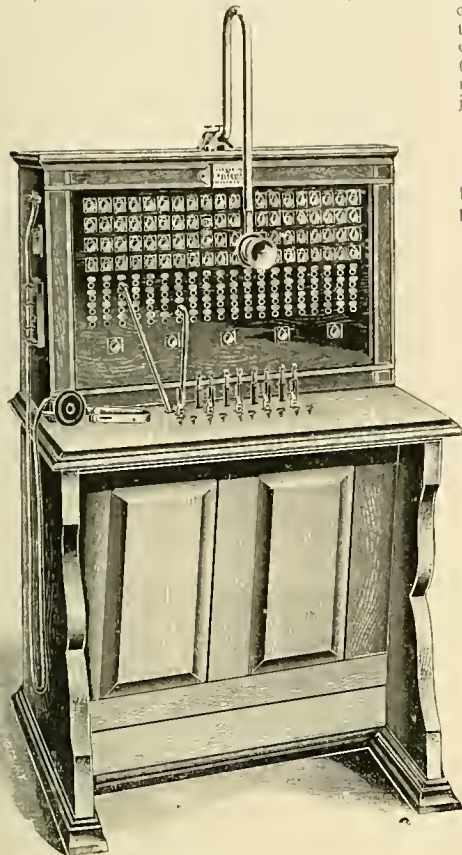


FIG. 1. INTERIOR TELEPHONE SYSTEM.

of the Carty patent, stated that the bell magnets were bridged between the sides of the line. The apparatus furnished to the Millheim company was not permanently bridged, and if the expert's statements are true, it is apparent that this apparatus was changed after it had been installed. None of the apparatus made by the company which furnished the Millheim apparatus is provided with permanently bridged bells, and the only inference to be drawn from the expert's deposition is that he made a misstatement of fact or that the local company had changed the circuits. The Court of Appeals did not go into the question of infringement, but contented itself with following the lower court in this particular, the lower court having accepted the expert's statements without critical examination.

And now comes the opportunity to "toot our own horn" a little in proclaiming to independent telephone users that the Western express No. 2 bridging-bell telephone is absolutely free from claims of the Carty patent, and of all other patents

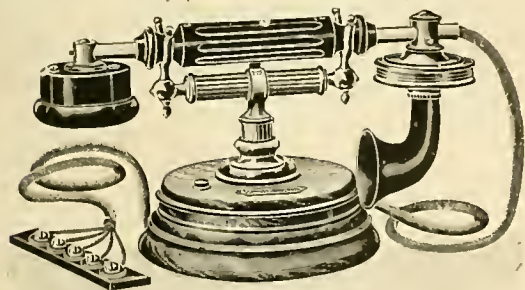


FIG. 2. INTERIOR TELEPHONE SYSTEM.

controlled by the American Bell Telephone company or others. The accompanying diagram (Fig. 1) shows connections of signaling apparatus of the instrument, which is shown complete in Fig. 2. Not only are the bell magnets not permanently bridged, but the telephone generator, when operated, rings its own bells in series. The ordinary Watson circuit is employed with the exception that the shunt-coil (A) and contact spring (R) are added.

These telephones may be changed from bridging to series type, or vice versa, in a few minutes. The desirability of accomplishing this result will be ap-



Fig. 1.

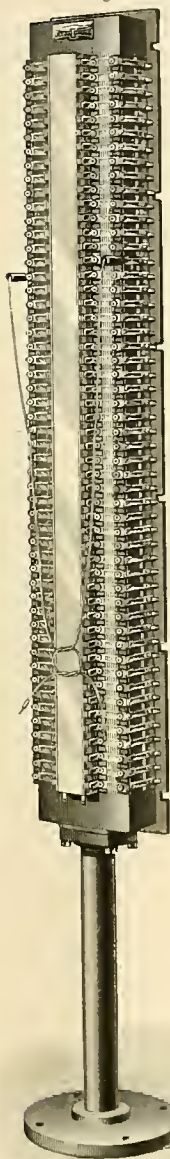


Fig. 2.

BURNS SNEAK-CURRENT ARRESTER.

cheap and serviceable. Its operation is simple; the heat coil springs out of circuit, leaving a gap of 1/2 inches. In other arresters the coil must break in order to open circuit, requiring an expert to repair them, and even then their usefulness is lessened by arcing.

The Burns arrester is practically indestructible and can be used over and over again indefinitely, thus reducing the cost of maintenance. The illustrations show a heat coil (Fig. 1) in its normal position, also warped after having been forced from cir-

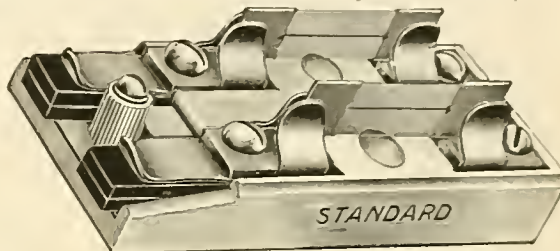


FIG. 1. LIGHTNING ARRESTERS.

used is the company's No. 70 combination microphone, with a clip on the handle, shown in Fig. 2. This clip is pressed down for calling and talking, and springs back when the pressure is removed, thus throwing the clearing-out drop. To the microphone is attached an eight-foot cord, so that the instrument may be laid on a night table by the bed and can be used while reclining. The other sets consist of small compact wall and portable desk telephones, the wood finish being in white enameled and various shades of oak, the metal parts being either of nickel or oxidized copper. The system includes 80 stations, and matches well the magnificent interior of the new club.

The Schmidt & Bruckner Electric company has a number of installations of this class in line, and although a great amount of special work is involved, its manufacturing facilities and experience particularly adapt it to this field.

A novelty in the use of telephone apparatus is the equipment of the elevators of the Park Row building, New York, with telephones connected to switchboards in the engine room. The chief requirement of such a system is telephones that will always work when called upon.

Lightning Arresters.

The question of selecting lightning arresters for the protection of telephone, telegraph and other sensitive instruments is a very important one; in fact, many experts consider it the most important feature of the entire construction of a telephone exchange. In the selection of a lightning arrester, for exchange service, consideration must be given the claims for simplicity of construction, durability and reliability, small space occupied, together with the quality of material used in the construction. It is claimed that all of these advantages are to be found in the arresters manufactured by the Harvard Electric company of Chicago. They are simple and durable in construction, and positive and reliable in action. They are known to the trade as the standard No. 66 and 134 combination porcelain fusible cut-out carbon lightning arresters for common return and metallic circuits. It is claimed that they are in use in every important telephone exchange and telegraph office in this and foreign countries.

The advantage of a combined fuse and carbon



FIG. 2. LIGHTNING ARRESTERS.

lightning arrester may be found in the cost of maintenance, safety, durability and readiness for service at all times.

Fig. 1 shows the standard porcelain double-pole combination fusible cut-out carbon lightning arrester for metallic circuit, and Fig. 2 illustrates a standard 10-circuit fusible cut-out carbon lightning arrester, mounted on a polished oak base, especially adapted for switchboard protection.

Severe tests under all conditions have demonstrated the efficiency of these devices. The fuse links are held in position by metallic clips, and can

be easily and quickly replaced. The spark-gap carbons are held firmly in fixed position, and cannot slide out of place so as to make connection, producing short circuits, and are readily removed for examination. The metal parts are mounted on a substantial porcelain base. All parts are indestructible, with the exception of the fuse links, and the cost of replacing them when burnt out is merely nominal. A fuse arrester used alone does not afford proper protection to sensitive instruments from damage by electric currents, nor does a fuse arrester, when used alone. The combination of these types must be employed to secure such immunity.

Operators of exchanges and toll lines and telephone users generally do not care to take chances in matter of interruption of service, causing a loss of revenue, inconvenience, waste of time and expense resulting from improper protection of apparatus. The Harvard Electric company of Chicago, which makes these arresters, has also a complete line of standard fuses, fusible cut-outs, center-plate and carbon lightning arresters.

Telephone Rates in Chicago.

The question of telephone rates and service in Chicago is one that directly appeals to every business man in the community. At present the Chicago Telephone company is charging rates that are not warranted by its franchise from the city. This condition has been commented on in these columns, and it is still a matter of discussion, provoking many complaints from unwilling patrons of the company. At the last meeting of the Illinois Manufacturers' association, at Chicago, June 16th, Martin B. Madden opened the discussion of the question of telephone rentals and tolls, which was the special order of the evening. He gave the history of the Chicago Telephone company and of the ordinance under which it operates. The rates charged by the company, he said, were much too high, and the service was decidedly inferior. The price of telephones had advanced until now they were as high as \$300 a year. The stock of the company, he said, had been watered until fabulous dividends were paid to the stockholders. He then read the ordinance, which placed a limit on telephone rates of \$125 for business and \$100 for private or house instruments. This section has already been published in the Western Electrician. Mr. Madden continued:

That the charges for telephone service in this city are out of all proportion to what is reasonable to produce a proper return on the cost of the plants required for the service admits of no question whatever. Companies formed in other cities in this union, except perhaps New York, where the price per annum has been raised from \$60 to \$250, furnish a service infinitely better than we receive for less than half what we are called upon to pay. Next to New York the rate in this city is higher than anywhere in the world for the same service.

The City Council should be requested to act in the matter so far as it is at present authorized to do so under the existing ordinance. Failing to accomplish the desired result, the Legislature should be appealed to to grant such authority as will enable the proper city authorities to see that no injustice is done to the telephone-using public.

T. K. Webster of the Webster Manufacturing company also spoke on the evils of the telephone system of Chicago. Among the other speakers were Arthur D. Wheeler of the Chicago Telephone company, W. A. Jackson of the Central Union Telephone company and J. E. Keelyn of the Western Telephone Construction company.

Commenting upon this meeting and the discussion of telephone rates, the Chicago Record says, editorially:

The Illinois Manufacturers' association at its banquet Friday evening discussed the subject of telephone rates. There was particular complaint regarding the rates for communication with other towns in the state.

The ordinance of the Chicago Telephone company, granted in 1889 for a 20-year period, contains this clause: "Said company, during the term for which this ordinance is granted, shall not increase to its present or future subscribers the rates for telephone service now established." Notwithstanding this clause the price of telephone service has been advanced from \$125 to \$175 a year. To be sure, the company furnishes a kind of service for \$125 a year and even less, but the price of its best service has been advanced. The intent of the ordinance of 1889 undoubtedly is that the best service of the company shall be furnished at the rate prevailing when the ordinance was passed. A telephone company, like other public-service corporations, is expected to keep abreast of the times in improvements and not increase its rates with every change for the betterment of the service.

The city government ought to take steps to compel the Chicago Telephone company to lower its charges for good service to \$125 a year, in accordance with the provisions of the franchise under which it operates. It is probable, however, that \$125 is an excessive price for telephone service. If honest legislators at Springfield can be induced to pass laws which shall lead to honest and wise regulation of telephone charges in Chicago and Illinois, the public will be deeply grateful. The curse of "sandbagging bills" and venal legislators is the most serious obstacle in the way of this important reform.

Busy; Please Call Again.

[From Harper's Bazar.]

"Hello, Central!" "What number, please?" "One hundred and two hundred and sixty-four." "I don't catch that." "One thousand two hundred and sixty-four." "Try it once more, please." "Twelve hundred and sixty-four." "Seven hundred and sixty-four." "Not twelve hundred and sixty-four— one thousand two hundred and sixty-four." "I can't give you two numbers at once. Which do you want first?" "I was giving you the same number two different ways." "A little louder, please. I can't quite make you out." "I said I was giving you the same number two different way." "Oh, yes. Well, what number do you want?" "Twelve hundred and sixty-four." "Suppose you give me one, five and separately like one, two, three, for instance." "All right. One, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve. Got that?" "Yes." "One, two, three, four, five, six. Got that?" "Yes." "One, two, three, four. Got that?" "Yes."

You want twelve, six, four, do you?" "Yes; twelve hundred sixty-four. Do you understand now?" "Yes; I understand. Twelve-sixty-four is busy now. Ring off, please."

Telephone News from the Northwest.

[From the Minneapolis correspondent of the Western Electrician.]

The Northwestern Telephone Exchange company is building a line to Princeton, Minn. The Northeastern Minnesota Telephone company of Rush City, Minn., will also build a toll line to Princeton.

The Northwestern Telephone Exchange company will have its new extension between Langdon, N. D., and Park River completed by July 1st.

The Waushara Telephone company of Berlin, Wis., has installed a new switchboard of 100 drops.

The Edgerton Telephone company has been granted a franchise for a local exchange at Edgerton, Wis.

The Badger State Telephone company is arranging to form a local company and install an exchange at Delavan, Wis.

The Minnesota Mutual Telephone and Telegraph company has been granted a franchise at Herman, Minn.

Charles Demorest, formerly manager of the Iowa Telephone company, at Eagle Grove, Ia., has been placed in charge of the company's office at Fort Dodge, Ia.

The Lake Mills (Wis.) Telephone company is extending a toll line northward to Faville Grove.

The Mutual Telephone company of Des Moines, Ia., is making large extensions and improvements to its system. New cables are being put up, sub-exchanges will be built and toll lines extended.

Dr. Chamberlain of Stratford, Ia., is an applicant for a telephone exchange at Webster City, Ia.

The Boone County Telephone company of Boone, Ia., has installed a new and larger switchboard.

The Marquette County Telephone company of Marquette, Mich., is arranging to build a system to cover Houghton, Ontonagon and Keweenaw counties in north Michigan. It proposes an active competition with the Bell interests at all points.

The Sioux Rapids Telephone company has been granted a franchise for a local exchange at Sioux Rapids, Ia.

The franchise granted the American Telephone and Telegraph company by the council of St. Paul has been accepted by the company.

The Zenith City Telephone company has started work on the new exchange to be put in at Duluth, Minn. Work has been started on conduits. This company has purchased the exchange at Ashland, Wis., of the Chequamegon Telephone company, now in course of construction. This will be completed and toll-line connection will be made between Ashland and Duluth.

A local telephone exchange is desired at St. Thomas, N. D., and when the long-distance system reaches St. Thomas an effort will be made to secure one.

The Home Telephone company of Sioux City, Ia., has completed a toll line to Le Mars, Ia.

The Northern Minnesota Telephone company will soon construct its proposed toll line between Menasha, Minn., and Wadena. The company has made a traffic agreement with the Northwestern Telephone Exchange company for connection. A local exchange is projected for Park Rapids also.

The Standard Telephone company has issued a warning to renters of its instruments in Southern Minnesota to the effect that complaint has been made of persons interrupting messages passing over the wire, by shouting and whistling, etc. The company asks for information when it occurs and promises to take out the offending telephone.

A local telephone exchange has been completed at Benson, Minn.

Hewett & Swanson are installing a local exchange in Warren, Minn.

The Nicollet County Telephone company of New Sweden, Minn., put in a line last summer at a cost of \$2,275. The running expenses since August, 1898, according to the annual statement, were \$41.60.

Work has been started on construction for the Lake Park, Minn., and Ulen telephone line. It is expected to be completed by July 1st.

The Minnesota Mutual Telephone company has been granted a franchise for an exchange at Hinckley, Minn.

The local telephone exchange being built in Le Sueur, Minn., will be connected with the Northwestern Telephone Exchange company's toll system.

Competition in the telephone line is in prospect for Austin, Minn.

The Southern Dakota Telephone company of Madison, S. D., is building a toll line from Mitchell to Chamberlain. When this is completed a line will be built to Scotland and other points.

MANUFACTURERS AND DEALERS.

The Sterling Electric company of Chicago has just completed equipments, similar to that installed at Mattoon and illustrated in this issue, for the Rock County Telephone company of Janesville, Wis.; Danville Telephone company of Danville, Ill.; Van Wert Home Telephone company of Van Wert, Ohio, and Wareham and Wood Telephone company of Manhattan, Kan. Many independent telephone companies desire apparatus similar to that used in Bell exchanges, as shown in the prosperity of the Sterling Electric company. During the last

year the company's facilities have been increased three-fold, the working force has been quadrupled, and the company has been forced to run its factory night and day to supply the demand. The Sterling apparatus, consisting of switchboards, cable terminals, distributing boards and protective devices, is accepted as reliable standard goods, similar devices being in use in the most modern Bell exchanges of to-day.

The Ericsson Telephone company of New York will be represented at the convention of the Independent Telephone association in Chicago next week by Messrs. Smith, Wells and Miller of that company's staff. The Ericsson company has been singularly fortunate during the last year in getting many large contracts, and its business has developed much faster than the management expected. As a result of this unusually large and steady demand for Ericsson products, the company has found some difficulty in obtaining goods from Sweden fast enough to fill its orders. The company has recently perfected an arrangement that will permit it to fill its orders much more expeditiously.

The Farr Telephone and Construction Supply company of Chicago has just issued its new catalogue, No. 8, which is also a hand-book of information. It is a neat pamphlet of 84 pages, and contains illustrations of everything used in the construction of telephone exchanges, and directions for those wishing to build a telephone exchange. The hand-book also contains quite a number of diagrams, showing the methods of connecting telephones. The Farr company, as is well known, handles everything in the telephone line, and is always looking out for improvements which will benefit the telephone manager. The company is at present doing three times as much business as it has done at any other time in its history, which speaks well for its products.

Telephones in Rural Districts.

[From the American Farmer.]

We find that the putting up of telephone lines has become very common in many sections, but we hear of no locality in which it has been better managed or proved a greater success than in Geauga County, Ohio. The telephone wires are strung throughout the 16 townships of that county. There are no cities in the county, and but few villages of any size, so their telephone system is essentially a rural one. It is now possible for every citizen of Geauga County to communicate by telephone, either directly or by messenger service, with every other citizen of the county, and by connection service with other lines, with an infinite number of points in surrounding counties.

One of the leading organizations is the Bainbridge Telephone company. It was organized by a company of eight farmers, nearly all of whom reside in the township of Bainbridge. They formed a regular stock company, each one taking a certain number of shares, and they went about the erection of poles and stringing of wires with the positive assurance of only a few patrons except themselves. But they have not been disappointed, as one farmer after another along their lines is asking to have a telephone put into his house, and many that are not along the lines are asking to have them extended so as to take them in. Those who take telephones are pretty sure to keep them, and only an instance or two has yet occurred where telephones have been removed, due to removal of patrons. This company began in the right way about the whole plant, and is a good model to be followed by other neighborhoods contemplating the erection of a system. They did not make the mistake of some other companies of putting up a cheap line. They purchased the best cedar poles, painted cross-arms, bought double-galvanized wire, as good telephones as could be had, and used the metallic circuit. This gave good service from the start, and did not get the patrons out of conceit with them through the line being constantly out of order. Their plant is now as good as any to be found in large cities.

The cost of erecting one mile of this system is approximately as follows:

Table with 2 columns: Item and Cost. Items include poles, cross-arms, insulators, wire, digging holes, and scattering poles. Total cost is \$51.50.

Nearly all the labor of erecting this particular line was done by the stockholders themselves. The president helped to dig holes, the manager did the stringing and stretching the wires, all hands turned in and erected the poles and did nearly all the other work. The poles are the main things to look out for. Those used in Geauga County are stocky, white cedar, 25 feet in length. The manager of the company, who is an intelligent young farmer, is becoming quite an electrical expert, and puts in telephones, makes proper connections, replenishes batteries and repairs them when out of order. The switchboard is located at the intersection of their lines at one of the stockholders' homes, and requires as much attention as a sick baby, but the attendants receive pay for their labor. The patrons are charged \$12 per year, payable in advance, or \$1.25 per month,

also in advance, for the use of their telephones. The company takes entire charge of keeping things in repair, and gives all patrons free use of one other country line almost as extensive; also a line to a neighboring small city, where farmers for miles around go to transact business.

The benefit to farmers of having far-reaching telephone lines are so numerous that they almost suggest themselves without mention. The volume of business that one can do and stay at home will astonish any farmer who tries it a month, and the total for a year is enormous. The telephone is speedily passing from an article of luxury to a thing of necessity. Nothing of importance occurs but one knows it immediately. The current news of the day, such as the ratification of the Spanish treaty, the battle at Manila, and in fact all the important intelligence, may be received by farmers at home or in the field as promptly as the newspaper offices in the cities. You can also, if you want, have the late papers read to you by some one miles away, if you don't want to wait until they arrive by mail. Another feature of great value to farmers is that the weather forecast can be obtained at any hour and enables one to prepare for weather conditions tomorrow. The doctor can be summoned or consulted at any time, though the way be long or the night be dark and stormy. The condition of sick friends may be learned at any time.

The social side of the telephone is especially felt in the country, where it relieves much of the loneliness by bringing distant places near, and renders a farmhouse close neighbor to all others miles away. In fact, the women folks get more comfort and enjoyment out of the telephone than anyone else. To them it comes a boon worth many times its annual cost. They take right hold and enjoy it. The prospect of visitors is known and the good wife rejoices that she can go about the preparation for their reception and escape the housekeeper's terror of being come upon suddenly, especially at meal times. No end of agreeable chats with friends all come within one's own house, though situated far in the country away from the busy scenes of city life. The ceaseless round of domestic duties is much more tiring and monotonous than outdoor work, and to women the telephone comes as a relief to this monotony that is inspiring. It is an antidote to the weariness of household drudgery. The family news items, recipes, the remedies, the congratulations, etc., that go over the line are simply too numerous to mention. The American Farmer's advice to all its hosts of patrons is, if you haven't telephone lines already, hasten to take steps to establish them. The cost is little, and the pleasure and the value derived from them are infinite. Nothing so tends to relieve that great bugbear of farm life, lonesomeness and sameness, as strings of wires connecting every farmhouse with all others for miles around and with the villages or cities in reach.

Telephone Repeater.

James Asher of Dunnville, Ont., has contributed an interesting account of the experiments that have been made in the development of telephone repeaters and a description of an instrument designed by him for special work of this kind to the London Electrical Review:

"Many inventors have tried to devise means by which telephonic messages might be repeated from one circuit into another, in order permit conversation over greater distances than would otherwise be possible. But little success in this regard has hitherto been attained. All telephone repeaters except that about to be described use the diaphragm of a receiving Bell telephone, or its equivalent, to vary the pressure in a microphone transmitter at the end of the second circuit, and so cause a repetition of the message in this circuit. Nearly all the telephone repeaters hitherto invented can be used only in repeating messages from the first circuit into a second. Few or none can repeat from a second into a third circuit, and so on, through an indefinite number of circuits, in a manner similar to repeating through an indefinite number of telegraphic circuits.

Telephone repeaters have usually been unsuccessful, because, although the diaphragm of the transmitter vibrates with considerable amplitude, the diaphragm of the receiver vibrates with an amplitude so small that it is not manifest to the sense of touch. Hence the variation in pressure on the carbon transmitter of a repeater is very small, and, in consequence, the telephonic message in the second circuit, if audible, is very weak even in short circuits.

"In the new telephone repeater a telephone receiver which speaks more loudly than a person is used. This loud-speaking receiver was invented by Mr. Edison more than 20 years ago. It is called the motograph. It consists in a cylinder of plaster-of-paris moistened with a certain solution. Pressed against the face of this cylinder is a strip of platinum, the other end of which is attached to a diaphragm. One wire is connected with the platinum spring and the other with the cylinder. On turning the cylinder steadily by hand, or other motor, the strip is drawn forward by friction on the cylinder, or released, according as a current passes or not, and according as a stronger or a weaker current of electricity passes through the chemical solution between the platinum spring and the cylinder. The sound of the receiver is dynamically caused by the motor which turns the cylinder. It is more difficult to turn the cylinder when receiving a message than when

the line is idle. The electric current merely controls the vibrations of the diaphragm, which throws the atmosphere into acoustic vibrations representing the voice of the sender. This motograph has been little used, because the Bell receiver, which is simpler, speaks in a sufficiently loud tone for common use.

"It recently occurred to the inventor of the new telephone repeater that by using Edison's loud-speaking receiver, or motograph, near the carbon or other suitable transmitter of a second circuit, a message spoken into the first circuit would be repeated with undiminished force into a second circuit. At the end of the second circuit a repeater may be used to forward the message into a third circuit, and so on. The number of repeaters will be one less than the number of circuits. At the end of the last circuit a Bell receiver may be used if desirable. By a suitable duplication of transmitting and receiving parts in each repeater telephonic messages may be sent in either direction automatically. A small electric motor will be suitable for driving the cylinder of each repeater during hours of business.

"The invention is automatic, and all parts of one or more continents would be brought within speaking distance. The reproduction of a speaker's voice, even at the opposite side of a continent, would be louder than the voice itself, because the voice at each repeater is dynamically due to the motive power which turns the cylinder. The reproduction of the voice at the end of a dozen circuits would be as loud as that at the end of the first circuit.

"Nothing would now prevent us from recording a phonogram, even at a distance of thousands of miles. At the end of the last circuit a phonograph may be set before the motograph receiver, and since this will speak as loudly as the person sending the message, the phonogram may be impressed as deeply on the wax cylinder as if the speaker were present. The phonogram tube may be detached from the phonograph and sent to the person addressed, who may, at his leisure, place it on his own phonograph and listen to the message. This phonogram may be saved and it may be caused to reproduce the voice of the correspondent at any future time."

Long-distance Transmission of Speech.

By J. H. WINFIELD.

Long-distance work is every day becoming a more important factor in the telephone business, and toll lines, instead of (as a few years ago) being regarded as mere accessories to the city exchanges, are now recognized as absolute necessities. We are talking over longer distances almost every month. A few years ago 500 miles was considered quite a feat; to-day we have conversations carried on over 1,900 miles of wire with perfect ease. In view of this, it may not be amiss to speak of a few of the difficulties that are encountered in the design, construction and operation of these long lines.

The apparatus used in making a toll-line connection may be divided into three parts: (1) the line, (2) the instruments, (3) the switching apparatus. The chief factor in extending the talking limit has been the improvement in the lines. Grounded circuits of iron wire are now practically obsolete, the recognized standard being a metallic circuit of hard-drawn copper wire, generally No. 10 B. & S., weighing 170 pounds to the mile, but sometimes, for short distances, of No. 12, weighing about 104 pounds to the mile. The New York and Chicago line is constructed of wire weighing 435 pounds to the mile, but that is an exceptional case.

In speaking of the line I shall confine myself to the electrical, rather than the mechanical difficulties that have been met with and overcome. Our object is to so construct the line and arrange the apparatus that the sounds at the receiving end shall possess the following characteristics: Loudness or volume, clearness, quality. Of these three clearness is by far the most important, for a faint sound, if clear, is perfectly intelligible, and a change in quality may only have the effect of disguising to some extent the speaker's voice. Volume is affected by any conditions which alter the amplitude of the wave.

Clearness is affected by any conditions which alter the position of the waves in regard to each other. Quality is affected by any conditions which alter the form of the wave. Therefore, the volume is reduced by resistance, leakage, static induction and self-induction, the effect of these properties being to reduce the amplitude of the wave.

Clearness is reduced by static induction and self-induction, these tending to alter the inter-relationships of the waves, static induction causing a rounding off of the top of the wave, thereby involving a loss of sharpness, while both static induction and self-induction produce an unequal retardation of phase for vibrations of different periods, thus causing interference and a resulting deformed wave. In other words, the telephone current, being an alternating current of a frequency varying from 200 to 1,500 periods per second, according to the sound produced, static induction and self-induction produce a greater retardation on the waves of high frequency than on the lower ones, thus mixing up the waves to some extent and rendering the speech muffled.

Quality is changed by all the properties which reduce the clearness, and by self-induction in another sense as well, this effect of self-induction being to reduce the amplitude of the overtone waves to a greater extent than of waves of a longer period.

Evidently, then, in order to accomplish high telephonic transmission of speech, we must take into account the self-induction and electrostatic capacity of the line and apparatus at low potentials, resistance and leakage being of less importance, though, of course, they should not be lost sight of. A small and well distributed leakage is often an advantage, as it allows the static charges to escape, clearing the line and to some extent neutralizing the effect of capacity, the slight loss in volume being more than counter-balanced by the gain in clearness. When iron wire is used there is a much further deformation of the waves than is caused by the increased resistance, due to the fact that the wire is circularly magnetized, and this magnetism has to be reversed twice in every vibration. There is also a considerable increase in self-induction, due to the magnetic properties of the metal.

The self-induction of a copper metallic circuit of No. 10 or 12 wire is very small, but the self-induction of the apparatus which always forms part of a telephone circuit is sometimes very high and has a considerable effect on the current. Long-distance lines would be particularly liable to disturbance from cross-talk if no means were taken to prevent it. There are two cases in which cross-talk will not be produced on a metallic circuit by a neighboring wire. The first is when the disturbing wire is at an equal distance from each of the wires of the metallic circuit. Were it always possible to string wires in this manner, there would be no trouble from cross-talk; but a little consideration will show that this is only possible for two circuits. The second method is known as transposing. The two wires of the metallic circuit are transposed at regular distances, or, in other words, they change places. A changing to the pin B was on and B going to the pin A was on, the effect being to place each wire of the circuit at an average distance from the disturbing wire or wires. As the number of wires on a pole increases, the difficulty of planning the transpositions increases also. With two circuits it is an easy matter; if, however, we have a third and transpose it, the same as we did the second, there will be cross-talk from the second to the third, because their relations to each other are the same as if there had been no transpositions at all. To get over this difficulty we must transpose the third twice as often as we did the second. A fourth circuit may be transposed at the middle points of the third, and so on. It has not been found necessary to transpose each circuit so that the induction currents are exactly balanced, and it is possible to use the same transpositions for every second cross-arm, so that the first, third and fifth are alike, also the second, fourth and sixth. Transpositions are usually placed half a mile or a mile apart.

There has been very little change in the instruments in the past few years. The transmitter usually used is of the "Hunning's" type, and is known as the solid-back. It does its work remarkably well. Some of them require a little attention now and then on account of the packing of the carbon granules, but a judicious tap generally puts matters to rights. The ringer magnets of the call bells should be wound to a resistance of 1,000 ohms on long spools, bringing the wire close to the core, and thus giving them a high coefficient of self-induction, which effectually prevents any shunting of the high-frequency telephone current, while allowing the ringing current to pass freely, the ringers being bridged across the circuit.

In order to connect a metallic circuit to a grounded line, what is known as a repeating coil or transformer must be used, otherwise the balance of the circuit would be destroyed and the line become noisy. This piece of apparatus is nothing more than a specially made induction coil, the metallic circuit being connected to the primary and the grounded line to the secondary, the other end of the secondary being put to ground. In connecting together two metallic circuits through an intermediate office, the connections should be so arranged that the lines are directly connected, and the two transformers cut out; otherwise, as a transformer only has an efficiency of from 85 to 90 per cent., there would be a serious loss in volume.

All apparatus at intermediate stations should be bridged across the lines, and the parts that are permanently in connection should have a high self-induction in order to avoid shunting the telephone current when the line is being used to stations farther on. Ring-off drops should be wound to 1,000 ohms resistance and also bridged. It is a good plan to use a tubular drop, as it not only increases the self-induction, but it also tends to prevent cross-talk between the coils themselves, which is a frequent cause of disturbance and often not suspected.

Long-distance lines should always be well equipped with protective devices. The best form for protection from lightning consists of two carbon blocks separated by a thin sheet of perforated mica, one block being connected to line and the other to ground. These have proved very efficient, and when properly installed generally prevent any damage to instruments or transformers. They also prove useful in another respect, as the static charges seem to find their way across from one plate to the other, clearing the line to a great extent. Many lines could be improved by a judicious use of these protectors at different points, such as the way stations. A fuse is also generally inserted in order to prevent the entrance of heavy currents, which might otherwise do considerable damage, when, as sometimes hap-

pens, an electric-light or power wire comes in contact with the circuit.

In regard to the operation of toll lines, long-distance telephony is much more expensive than telegraphy, as may easily be seen when we consider that a single iron telegraph wire can easily transmit 40 messages per hour, and when duplexed the number is doubled; whereas in the telephone work we have to use two wires, and they must be of copper instead of iron, and even then under the best conditions it is hard to get more than seven or eight messages through in an hour. Add to this the fact that the sender of the message is aware of every minute of delay, and is usually very impatient when he has to wait a few minutes for the line, where, in sending a telegram, he just hands it in at the office and thinks no more about it, even though the message may not be sent for half an hour or longer, and it is easily seen that not only must the telephone message cost more than a telegram, but the lines are apt to be choked with business during a few hours in the middle of the day and comparatively idle the rest of the time. A great deal can be done by keeping the subscribers posted in reference to the hours when the lines are rushed, and very often they can so arrange their business that it will not come in the rush hours. They would thus save themselves the annoyance of having to wait for a connection and the lines would be worked more steadily.

Development of the Telephone.

[From the Boston News Bureau, June 1st.]

Canvassers in 20 cities of the Erie telephone system last week obtained 1,735 new subscribers, the largest number of contracts ever taken during the history of the telephone, except, possibly, in the very early days of the invention.

This systematic canvass is under the supervision of Mr. C. E. Nestor of San Francisco, and clearly demonstrates that there is no trouble in securing new subscribers if the value of the service is properly placed before the people. The Erie system on April 30th numbered 76,851 subscribers, in eight states, namely, North Dakota, South Dakota, Minnesota, Wisconsin, Michigan, Arkansas, Texas and the city of Cleveland, O.

The result of the canvass indicates that the company will have no difficulty in securing 100,000 subscribers before the close of the year. Even with this number, it will fall about one per cent. short of the development of General Sabin's Pacific coast states, Washington, Oregon and California, so there is still to be worked for the Erie management to do in 1900 to overtake the California telephone magnate.

The net gain in a few of the Erie's principal cities since January 1st has been about as follows: Milwaukee, 1,000; St. Paul, 1,200; Detroit, 1,300; Minneapolis, 2,000; Cleveland, 3,000, and in other cities of Michigan and the Southwest the growth has been proportionately as large, the total net increase since January being about 17,000, or 7,000 more than the entire year 1898.

The company is experiencing some difficulty in obtaining material for subscribers, and it is said throughout the Erie system 7,000 subscribers are waiting connection, but the end of June will probably reduce this number to a minimum.

The company has located three new branch offices at Milwaukee, four in Detroit and five in Cleveland, and employs in all departments 5,000 people.

Telephone in Various Countries.

[From the London Financial Times.]

There has just been issued a foreign-office report on the telephone service in various foreign countries which was called for in Parliament in October, 1897, by Mr. Provand, M. P. Twenty-three queries, embracing all matters connected with the telephone service abroad, were put to the consular agents in the different countries. From the replies of these gentlemen it seems that in Austria, Bavaria, Belgium, Germany and Switzerland the telephone system is in the hands of the government; in Italy, of a company; in the Netherlands, of municipalities; in Russia (Helsingfors), of a local company; in Norway and Sweden, of the state and private companies, and in the United States, of a company which has no monopoly to carry on the public telephone service. These concessions are, of course, more or less onerous, involving generally payments or the giving of exceptional facilities to governments or authorities granting the concessions. The New York company alone is exceptional, its concession involving no liability, though, on the other hand, it is not exempt from competition. A number of the systems which now belong to governments were introduced by private companies, whose interest were generally brought out when they began to affect, as they generally did, the government telegraph system.

There is little or no information to be found on the question whether the telephone pays in the hands of the government. The Italian company, however, paid 10 per cent in 1896, the "Allmannia" company, 20 per cent; the Christiania Telephone company 2 1/2 per cent; the Bergen company six and the London and the New York company six per cent. In Amsterdam there was a surplus of £3,987 in 1897, but no consideration was given for the telephone as principal property.

EXTENSIONS AND IMPROVEMENTS.

The Sunset Telephone and Telegraph company is making arrangements to extend its line from Snohomish to Monroe, Wash.

Work has commenced on the telephone line from Aunisville via Shaw to Macleay, where it will connect with the Salem, Ore., line.

The Northwest Telephone and Telegraph company of Huntington, Ore., will build a line through to Pine, Ballards and the Seven Devils.

The Sunset Telephone company of California will extend its long-distance line from Colfax to Reno, Carson and Virginia City this year.

The Mason County Logging company will shortly establish a telephone line between Olympia, Wash., and the company's camp in the Black Hills.

The Sunset Telephone company is extending its lines in Woodland, Cal. Manager Roberts has orders to put in quite a number of new instruments.

Otto Wettstein, Jr., of La Porte City, Ia., has been granted a telephone franchise at Belle Plaine, Iowa, and has secured 110 subscribers. Construction will be commenced at once.

The Lee County (Ill.) Telephone company is building a toll line from Paw Paw, in Lee County, to Earlville, in La Salle County, and an exchange of 50 subscribers in the latter place.

The Inland Telephone company will erect a new building in Spokane, Wash. The office will have a frontage of 25 feet with a depth of 80 feet. When complete the building, with the fixtures, will cost \$80,000.

The Port Steele (B. C.) Prospector says: "A telephone will at once be established between Elko and Tobacco Plains. It is said that the British Columbia Telephone company is the projector of the line."

Twenty linemen of the Detroit Telephone company are on strike for an eight-hour day and a new scale. The men refused to arbitrate and by their sudden withdrawal crippled the service in a portion of the town.

W. H. Dacey, manager of the Salem, Ore., division of the Oregon Telephone and Telegraph company, says that an aluminum wire will be strung between Salem and Albany to be used for local business only.

F. Bell, assistant superintendent of the Sunset Telephone company, has been investigating the question of extending the company's telephone system across the Cascades. The company asks for a guarantee of \$3,000.

The Sunset Telephone company is making arrangements to run its lines to La Honda, via Woodside and Searsville. A new line will be put up, which will establish communication between Redwood City, Cal., and La Honda.

The Jerome Telephone company is negotiating with F. L. Wright of the Prescott (Ariz.) Electric company for telephone connection with the latter system. If successful, the Prescott company will build the line about 10 miles out to meet the Jerome company.

The Home Telephone company of Rochester, N. Y., has commenced the work of developing its exchange. Charles E. Stinson, who for 17 years has been employed by the Bell Telephone company, has been selected for superintendent of the new system.

The Chicago Telephone company has bought 80 feet in Union avenue, east front, north of Root street, Chicago, from John A. Spoor and H. W. Webb, for \$4,800. The ground will be improved at once with a new building, and may be used for exchange purposes.

The Rocky Mountain Bell Telephone company proposes to spend a large amount of money this year extending its lines, especially in Montana. The capital stock of the company was increased from \$500,000 to \$1,000,000, and agents of the company are now in Boston negotiating a loan of \$225,000 for immediate extensions and improvements.

The San Diego (Cal.) Sun says that there is an urgent demand for a telephone at the lighthouse or some equally conspicuous spot on the highest part of Point Loma. The project has been recommended by all the pilots and mariners who have had occasion to enter San Diego harbor. The need of the line is now greater than ever since the advent of the Oriental steamship line.

Within a few weeks Denver will be connected by telephone with Cheyenne, Wyo., and other towns. Workmen will begin at once on the short strip of line between Fort Collins and the Wyoming capital, and will push construction as rapidly as possible. Under the agreement with the American Bell Telephone company, under which the Colorado company operates, the Denver company has only Colorado and New Mexico, and the Denver end will be only as far as the state line, half a dozen miles from Cheyenne, where the wires will connect with the Rocky Mountain Telephone company's circuits, which will give connection with

Cheyenne and Laramie. The Colorado company will rush the construction, taking in Glenwood Springs, Buena Vista and Salida, and will immediately afterward begin on the surveys for the New Mexican line, work on which can be done late in the fall. It is proposed to connect Denver with Santa Fe and Albuquerque, as well as the other large cities and towns in that vicinity.

J. I. Sabin, president of the Pacific States Telephone company, has purchased from the Vernon and Nelson Telephone company the lines connecting Rossland, B. C., with the system in the United States. Additional lines will be built immediately from Rossland to connect with the extra circuits now being built from Northport to Spokane, from Bossburg to Greenwood and from Meyers Falls to Republic.

The principal mines of Tintic and the leading mercantile houses of the mining sections embracing Mammoth, Robinson, Silver City and Diamond are immediately to be given direct telephone communication with Salt Lake City. A. J. Vance, representing the Rocky Mountain Bell Telephone company, has concluded arrangements. The company will erect a building for the exchange in Salt Lake City. The central office will be established in Robinson.

The New Ulm (Minn.) Telephone exchange has made arrangements with the Northwestern Telephone Exchange company to connect with its lines, and the patrons of the former exchange can now reach by telephone all parts of Minnesota, North and South Dakota, Iowa, and, in fact, any stations of the Northwestern company. Quite a number of improvements have been made in the New Ulm exchange, and there are at present over 150 subscribers connected.

The Sunset Telephone and Telegraph company is gradually extending its underground system throughout Los Angeles, Cal., and within the present year expects to have all of its trunk lines under ground. The company has submitted for approval by the council plans for conduit systems on Grand avenue, between Sixth and Seventh streets, First street from Alameda street to Santa Fe avenue, Third street from Los Angeles street to Central avenue, and Figueroa street between Washington and Adams streets. These plans will be approved and the work of putting the wires underground will be commenced at once.

TELEPHONY ABROAD.

The telephone question is still uppermost in the English mind. The Nottingham City Council has passed a resolution strongly objecting to the scheme proposed by the financial secretary to the treasury for dealing with the telephone question, on the grounds that no provision is being made out of imperial funds for the large provincial towns, as is proposed for London; that London subscribers will get the benefit of imperial expenditure, and be freed from the 10 per cent. royalty provincial subscribers have to pay; that the proposal to allow a municipality to compete until 1911 with the National Telephone company, where the company is well established in a town, can only end in a loss and inconvenience to the public, and that, if the competition is to be carried on, it should be by government. The council of the London Chamber of Commerce proposes to urge upon the government that it is undesirable that the postmaster-general should license the councils of county boroughs, as proposed in the telephone bill now awaiting second reading, to provide systems of public telephonic communication, pending the report of the joint committee about to be appointed by the two houses to consider the whole question of municipal trading.

The last annual report of the Oriental Telephone and Electric company, an English corporation doing business in the Far East, shows a credit balance of £10,655 3s. 9d. transferred to profit and loss. Including £964 8s. 3d. brought forward, and after deducting £2,858 8s., the amount of interim dividend paid in November last, there remains £9,061 4s. for disposal. The directors propose to pay a final dividend of 8d. per share, free of tax, making five per cent. for the year, to transfer £2,000 to reserve, and carry forward £1,344 8s. Of the Indian subsidiary companies, the Bombay company has again paid six per cent. for the year, and the Bengal company has paid five per cent., against seven per cent. for the previous year, carrying forward Rs 20,000 as a precautionary measure against possible temporary outlay. The Telephone company of Egypt has declared its usual dividend of six per cent. on its preferred shares. This company has recently entered into an agreement with the government of Egypt to continue the government telephone service for a period of 25 years from January 1st. Its business in general progresses favorably. The China and Japan Telephone company has paid its debenture interest, but its accounts for the last year have not yet been audited. They point, however, to a larger surplus than in previous years. With a view to improving the telephone service at Shanghai, which would have involved a large expenditure of money, the directors approached the council of the Shanghai settlements some years ago to obtain, if possible, a prolonged term of concession so as to justify the outlay. The council has now decided to grant a 30-year concess-

sion, but has invited bids for the privileges by public advertisement. The directors of the China and Japan company have sent in a bid, but the result so far is not known.

Telephone progress is reported in the West of England by the Bristol Chamber of Commerce annual report. Early in the year, the document says, serious complaints reached the council of the chamber of the interruption to communication on the trunk lines between Bristol and Plymouth. Accordingly, representations were made to the General Postoffice authorities upon the subject, and answer was made to the effect that just prior to the date of the complaint several working parties were engaged on the lines, which probably caused the interruption, but now that the lines were in order, the postal authorities hoped that no further difficulty would be experienced. There are, however, the council of the chamber said, on frequent occasions very serious delays, which point to the necessity for the early provision of additional trunk lines between Bristol and the towns in the West of England. Representations were also made to the council of the chamber upon the inefficient trunk-line service between Bristol and London. The secretary to the Chamber of Commerce communicated with the Bristol postmaster and surveyor, and was informed that the department would lose no time in completing and bringing into use a second trunk line between Bristol and London. With reference to the nationalization of the telephone system, the council expressed its views in the following resolution: "That having regard to the disadvantages arising out of the present working of the telephone service under the dual control of government and the National Telephone company, it is the opinion of the council of this chamber that the government should take immediate steps to acquire the undertaking of the telephone company upon just and reasonable terms as between the nation and the company's shareholders."

The latest developments in the telephone situation in Great Britain are outlined in the following cable dispatch to the Chicago Tribune from London on June 21st: "The House of Commons yesterday spent most of its time over the telephone bill. England is in this, as in most other modern inventions, hopelessly behind other countries. The telephone system now in the hands of the National Telephone company is both expensive and gives bad service. In London it is still almost entirely confined to business offices, and its use in private houses is almost unknown. The long-distance service is execrable. The National company, in the first place, is controlled by government red tape, and, secondly, it uses bad wires, and the whole system is made up on the principle that the government will eventually buy up the company at a high price. In the meantime, since the government controls the telegraph system, the telephone company is not allowed to compete with the telegraph. Not only are long-distance rates frightfully expensive, but many absurd restrictions are enforced. As, for instance, the cable company may not accept messages over the telephone lest the telegraph company should lose thereby. Accordingly, even when the telegraph is closed, as is usual in the country after a certain hour, no one desiring to cable could do so by means of the telephone. All these restrictions bring about the result that in England one person uses the telephone where five do so in the United States. The bill now introduced by Mr. Hanbury is to introduce the service all over England, to be offered to all alike at moderate terms. The chief objectors to the bill are, of course, the National Telephone company, which hoped for a government scheme which would mean the buying up of the company at an exorbitant price, and the big manufacturing firms who at present get advantageous terms from the company. The bill is still under discussion, but the general feeling is something must be done to put England on an equal footing with the other countries in this respect."

A California Farm Telephone.

[From the American Agriculturist.]

The Salinas Valley Land company has a telephone system, the line of which consists of the ordinary barbed wire that was already on the fences. It is about 10 miles long. We use a good telephone instrument. All the connections are made very close, and no wire is connected with the ground in any way, either by hanging down or by touching any other wire that does reach the ground.

In crossing roads and gates the preferable way is to have posts high enough to carry an overhead wire, but we took three-eighth-inch iron water pipes and laid them under the gates and most of the roads and then ran a rubber-covered wire through them to connect with the barbed wire on each side, bending the ends of the pipe up at the sides of the gates or roads and then filling the ends up with putty to keep water out.

This character of telephone line will work just as well as any insulated line in dry weather, but not at all when it is raining, because then the current runs in the ground. As soon as the posts have time to dry off after a rain it is all right again. Such lines will work for any reasonable distance, say from one to 100 miles, but in states where it often rains they will not do well.

Telephone Companies Excluded.

At last the Supreme Court of the United States has put to rest the question of the applicability to telephone companies of the act of Congress of 1866, authorizing telegraph companies to construct and operate lines of telegraph over the public domain and post roads of the United States. This it has done in the case of the city of Richmond against the Southern Bell Telephone and Telegraph company.

As the court itself sums up its decision, it is that the act of 1866 and the sections of the Revised Statutes in which the provisions of that act have been preserved have no application to telephone companies whose business is that of electrically transmitting articulate speech between different points. Upon the question of the power of Congress to control the use of streets in the towns and cities of the country, concerning which something was said in argument, the court states that it was not necessary to express any opinion.

Referring to several adjudged cases to which its attention was called, in some of which it was said that communication by telephone was communication by telegraph, the Supreme Court declares that none of those cases involved a construction of the act of Congress, and that the general language employed in some of them cannot be regarded as decisive in respect of the scope and effect of that act, however pertinent it may have been as to the meaning of the particular statutes under examination.

It may be, the Supreme Court goes on to say, that the public policy intended to be promoted by the act of Congress of 1866 would suggest the granting to telephone companies of the rights and privileges accorded to telegraph companies, and it may be that, if the telephone had been known and in use when that act was passed, Congress would have embraced in its provisions companies employing instruments for electrically transmitting articulate speech. But, it explains, the question is not what Congress might have done in 1866, nor what it may or ought now to do, but what was in its mind when enacting the statute in question. Of the different modes now employed to electrically transmit messages between distant points, Congress, in 1866, knew only of the invention then and now popularly called the "telegraph." When, therefore, the act of 1866 speaks of telegraph companies, it could have meant only such companies as employed the means then used or embraced by existing inventions for the purpose of transmitting messages merely by sounds of instruments and by signs or writings.

It is not the function of the judiciary, the court holds, because of discoveries after the act of 1866, to broaden the provisions of that act so that it will include corporations or companies that were not, and could not have been at that time, within the contemplation of Congress. In other words, it insists that it is clear that the courts should not construe an act of Congress relating in terms only to "telegraph" companies as intended to confer upon companies engaged in telephone business any special rights in the streets of cities and towns of the country, unless such intention has been clearly manifested.

The court further says that it is unwilling to rest the construction of an important act of Congress upon implication merely, particularly if that construction might tend to narrow the full control always exercised by the local authorities of the states over streets and alleys within their respective jurisdictions. If Congress desires to extend the provisions of the act of 1866 to companies engaged in the business of electrically transmitting articulate speech—that is, to companies popularly known as "telephone companies," and never otherwise designated in common speech—it says, let it do so in plain words. It will be time enough when such legislation is enacted to consider any questions of constitutional law that may be suggested by it.

Reasonable Care Defined as Great Care.

A countryman, who had driven into town, stopped his horse near a drinking fountain, and in order to remove some wire that lay in the street, between his horse and the fountain, picked it up, and received through it a powerful electric current that inflicted permanent injuries, for which he brought suit against the telephone company whose wire it was, and against the electric-railway company, whose current, it was contended, did the harm.

To begin with, the Court of Errors and Appeals of New Jersey says (New York and New Jersey Telephone company against Bennett), the defendants were each maintaining wires in a public highway, in the exercise of franchise, not of an easement. Hence, each was bound to take reasonable care not to injure other users of the streets. One factor in the measure of reasonable care is the probable result of negligence. In the use of a powerful electric current in the public streets reasonable care is great care.

The question of whether the linemen of the telephone company had been reasonably diligent in discovering the fallen wire, and in preventing probable injury, it holds, was properly left to the jury. Likewise, it maintains that whether the failure of the trolley company to use guard-wires was negligence by which the plaintiff was injured was for the determination of the jury. So, too, the contributory negligence of the plaintiff, the court holds, was a jury question, pure and simple. How much a countryman would know about the danger of picking up a wire in the streets of a town, what inference he ought

to have drawn from what he saw and heard, on the whole, his conduct showed less than reasonable caution, the court continues, were entirely outside the domain of fact.

Last of all, the court held, that if the plaintiff used reasonable care in the selection of a reputable physician to cure his injury, he could not be kept out of damage because with a better physician he would have had better results.

Power of City to Require Removal of Telephone Poles and Wires.

It is held by the United States Circuit Court that a city, being vested by the Legislature with the power of supervision and control of its streets, has the authority to require a telephone company to transfer its poles and wires from in front of, say, two blocks in the city to the alley next adjoining the street, provided it is done in good faith, and can fairly be seen to be directed to a legitimate purpose falling within the purposes of the delegated authority.

This is the practical result of the decision of the court in the recent case of the Michigan Telephone company against the city of Charlotte, wherein it was sought to enjoin the city from enforcing an ordinance of this character, which was passed upon the grounds that the poles to be removed were decayed to such an extent that they had become inadequate to the support of the system of wires they carried, and that the company had accumulated on the poles a great number of wires, which it employed in the conduct of its business, and to such an extent as to endanger the life and safety of the citizens of the city, and others occupying the building on the street or traveling therein.

The power of the Common Council to order such a transfer was denied by the company, which alleged that while its poles were defective, and the system needed repair in that respect, it proposed to substitute new and sufficient poles in place of the old, and in this respect stood ready to comply with the requirement of the ordinance.

Among the more specific points decided by the court is that a federal court has jurisdiction of such a suit for injunction, under that clause of the constitution which forbids the impairment of the obligations of contracts by state Legislatures. But, having taken jurisdiction, the court holds that section 5263 of the United States statutes, authorizing the construction of lines of telegraph over post roads, is permissive merely, and was not intended to arbitrarily disturb or interfere with the exercise of the police powers of the state, and would not sustain the company in its contention in such a case as this. Nor does the court consider that the action of the Common Council of the city in this case constituted an unlawful interference with commerce between the several states, assuming that the interstate commerce rule applies to telephonic communications as means of such commerce. And it does not consider that the ordinance amounted to an impairment of the obligation of the contract between the company and the city, assuming the existence of such a contract, because contracts of this character are subject to such incidental modifications as result from legislation required in the public interest. Moreover, the court denies that the action of the Common Council deprived the company of its property without due process of law, as that would necessitate the assumption that the company had a vested right to occupy this particular street, which the court pronounces untenable.

The New German-American Cable.

[From the New York Tribune.]

The cable-laying steamer *Britannia* Captain Woodcock, which came into port and anchored in the Upper Bay, off Liberty Island yesterday [June 11th], has almost completed the work of surveying for the new submarine cable which will connect Germany with the United States by way of the Azores. The Emperor of Germany is greatly interested in the new cable, and as permission was granted some time ago by the United States government for the landing of the cable on this side, George G. Ward, vice-president and general manager of the Commercial Cable company, went to Europe on short notice by the St. Paul a few weeks ago, and is at present consulting with the emperor on the project. A report of the soundings made in crossing the Atlantic will be given to the officers of the Commercial Cable company. This company has charge of the construction and laying of the cable, and the German Atlantic Telegraph company will operate it.

The proposed cable line will start at Embley, Germany, and touch at Ponta Delgada, Azores, and the final landing place of the American end will most probably be at Coney Island. The line, when completed, will cost nearly \$25,000,000, and the German backers of the enterprise are the firm of Felten & Guillaume of Mulheim-on-the-Rhine, the Schaafhausen Bankverein, the Darmstadter Bank, the Disconto-Gesellschaft, the Dresdner Bank, the Messrs. Bleichroder and the Land and Sea Cable company of Cologne. The Commercial Cable company of this city is reported to have a financial interest in the new ocean telegraph line, and its interest in the German cable will give the American corporation direct wire connection with the chief cities of Southern Europe, including a number on both sides of the Mediterranean.

The longest stretch of the cable, between the

Azores and New York city, will measure 2,279 miles. At present the Azores can be reached from the United States only by way of London and Lisbon, and another point in Portugal. The American companies interested in the new cable scheme have agreed, it is said, to use the line for transmission of their dispatches to and from Germany, and the German postoffice has, it is understood, as a sort of subsidy, guaranteed the transmission annually of a certain number of words. This, it is said, insures the profitable working of the new submarine line. The headquarters of the German branch of the cable syndicate are at Cologne.

The new cable will do away with the complaints made by shipping agents here of the great delay in getting messages between America and the Azores. Disabled passenger vessels as a rule head for St. Michaels, in the Azores, but it sometimes takes days after their safe arrival there to get the news to New York. The submarine line will doubtless be a great stimulus to trade relations between the United States and Germany.

The steamship Britannia left Fayal for this port on May 14. The continuation of the soundings from Emden was taken up at Ponta Delgada. The officers of the cable ship declined to talk about the trip or discoveries made while sounding the bed of the Atlantic along the proposed route until they made their reports to the agents of the Commercial Cable company.

Before sailing for Germany Vice-president Ward said: "Emperor William has expressed the wish that the cable be laid as quickly as possible, believing that it will be the means of promoting good will between the two countries, and I shall expedite the work as much as possible."

The new cable will be laid and in operation by October unless the present plans fall through.

CORRESPONDENCE.

New York Notes.

New York, June 19.—Mr. Vreeland says that the power house of the Metropolitan Street Railway company, which, with its 70,000 horse power, will be the largest in the world, will be completed by fall. The new plant will give all the power necessary for the running of the Broadway, Columbus and Lexington avenue lines. The power houses now in use will be retained in case of emergency. Mr. Vreeland said that work in connection with the proposed electrical equipment of the cable roads was now in progress on all three lines, but that it would be several months before it was completed. Much of the work, it was explained, is being done at night.

Many of the employees of the surface street-railway companies of the city are organizing as assemblies of the Knights of Labor. It is said that the "trippers" on the Metropolitan lines are dissatisfied with their lot, but it is not expected that a strike will be brought about.

The New York and Queens Light and Power company, the Flushing Gas and Electric Light company and the Newtown Light and Power company of the borough of Queens have been merged in one, and it is said the field of operations will be extended whenever it is possible to secure contracts outside of the present territory. The new corporation is known as the New York and Queens Gas and Electric company.

In Orange, N. J., the Common Council is considering the municipal ownership of an electric-light plant. The city counsel has been directed to prepare the necessary resolutions and ordinances.

One of the big rubber tires on an electric cab exploded one night last week at Broadway and Thirty-second street. The excessive heat of the day had caused the pavements to warm up, and they in turn heated the air in the tire, causing it to expand and rupture a weak spot in the rubber. There was no one in the cab at the time. The vehicle careened to an angle of 45 degrees, and the driver was almost thrown off the box. It righted, however, and the driver managed to take it in its damaged condition to the stable. It is said to be the first accident of the kind since the horseless cabs came into use here. M. S.

Canadian Intelligence.

Ottawa, June 19.—The committee of the City Council of Winnipeg, Man., has recommended the acceptance of the tender of the Western Electric company of Chicago for electric-lighting machinery at \$5,320. The same company secures the contract for lamps and globes, supplying 220 at a cost, complete, of \$4,722. The offer of the Winnipeg Street Railway company to operate the lights at 25 cents was rejected.

The Ottawa Electric company has made a proposition to the City Council of Ottawa, Ont., to dispose of its lighting plant to the city. Many of the city aldermen are in favor of the city operating its own electric-light plant. The nature of the proposition, so far as can be learned, is that the company offers to dispose of its plant, good-will, business and personal connections to the city at par, or, in other words, that the corporation take the entire stock at par value. The work amounts to about \$1,000,000. The Electric company agrees to hold the offer open for one year,

on the express condition that the city does not grant, in the meantime, an extension to the franchise of any now competing company (the Metropolitan Electric company, which is seeking a 20-year extension) and does not issue a franchise to any outside company.

The city of Ottawa, Ont., has issued a writ against the Ottawa Electric Street Railway company to secure the specific performance of an agreement to extend its line to the Exhibition grounds and to Ottawa East. The writ asks for \$10,000 damages in default of building the extensions.

The police commissioners of Toronto, Ont., have decided to purchase an electric ambulance. Should this vehicle, after having been subjected to a thorough test, prove satisfactory, as it is claimed it will, all the police patrol wagons of the city will be operated by electric power.

Attention has been called to the fact that the Montreal Street Railway company is using fenders on its cars which are of no practical use as life-savers. Two deaths under car wheels have forced the question upon the consideration of the authorities. The company is under contract with the city to equip its cars with serviceable fenders which, it is alleged, those in use now are not.

A Toronto syndicate is now negotiating with the St. Hyacinthe (Que.) Hydraulic Power company, as well as with the gas-works company of that town, for the purchase of both plants. The offer made is in the neighborhood of \$175,000. The Toronto company proposes to very materially enlarge both plants and thus reduce the present cost of production.

Mr. R. G. Reid of Montreal has just added another to his many enterprises in Newfoundland in the conclusion of arrangements for the immediate construction of an electric railway in the city of St. John's. Contracts have been made with the Messrs. Lariviere of Montreal for cars of improved style, with the Westinghouse people for electrical apparatus, with the Canada Switch company for the necessary trucks, and with the Stilwell-Bierce and Smith-Vaile company of Dayton, O., for water wheels. The power to operate the line will be generated at a point eight miles from St. John's, and it is the intention to have a system first-class in every respect. The first cars are to be delivered in July or August, and the railway will be opened in the early part of next fall.

The Shawinigan Water and Power company of Montreal, whose plans contemplate the largest water-power development in the world, outside of Niagara Falls, is showing that it means business, for it has just let contracts which will involve an expenditure of over \$300,000. This contract, which is only a preliminary, is for the canals, bulkheads, foundations for power houses, etc., required to develop 30,000 horse power, and a railway to connect the Shawinigan Falls with the Great Northern railway, a distance of 4½ miles.

The West Kootenay Power and Light company of Rossland, B. C., has met with such success in its power-transmission project that it has found it necessary to increase its plant to double the present capacity. About a year ago this company commenced supplying current to its customers at Rossland and Trail, a distance of nearly 40 miles from the power house, which is located at Bonington Falls, on the Kootenay River, and to-day has more orders for power that it can supply. The present generating plant consists of two 1,000 horse power, three-phase, revolving-field dynamos, and the company has just placed an order for a 2,000 horse power generator of the same type. The Canadian General Electric company is also supplying a complete equipment of marble-panel switchboards and 3,000 kilowatts' capacity in high-potential step-up and step-down transformers. When this additional installation is completed, the West Kootenay company will have one of the largest power plants in the Dominion, and the distance of transmission is the greatest now in operation in Canada.

The Canadian Motor Syndicate, pioneer of the horseless-carriage movement in Canada, has within the past month established works in Toronto, Ont., and it is said the company is already busy with orders for electric delivery vans and carriages.

The solid masonry of the dam across the Jacques Cartier River, at St. Catharines, Que., has been completed, and four 54-inch water-wheels of the most modern type are to be used to develop power. It is proposed to deliver in Quebec, for electrical purposes, 5,000 horse power. The work will probably be completed by July next, at a cost estimated at about \$275,000.

The B. Greening Wire company of Hamilton, Ont., had installed in its works, about three months ago, a 40 horse power S. K. C. two-phase motor. It receives its current from the Cataract Power company. This has worked so satisfactorily that it has placed an additional order for one 50 horse power, one 30 horse power and one 20 horse power motor of the same type, to work its entire works by electricity. The Gurney-Tilden company of the same city is also having installed in its works one 30 horse power, three 15 horse power and one seven horse power S. K. C. two-phase motors, which are to drive the machinery and elevators in their entire works, altogether replacing steam. At this rate Hamilton will soon be a smokeless city, as the engines of the Hamilton Electric Light and Power company were closed down in March last, and have not been in operation since, everything being driven by the power from De Cew Falls. A. V. W.

PERSONAL.

Silvanus P. Thompson is slated as the next president of the British Institution of Electrical Engineers.

Mr. A. E. Dresser, salesman for the Fort Wayne Electric Works in the state of New York, has established his office at 717 Dillaye building, Syracuse.

The Rumford medal for the practical development of arc lighting has been awarded to Mr. Charles F. Brush by the American Academy of Arts and Sciences.

A. W. Ebeling, for many years connected with the Otto Gas Engine Works, has resigned his position as secretary of that company. He proposes to take a vacation this summer before assuming fresh business burdens.

At Rochester, Minn., June 21st, Miss Elizabeth Genevieve Feeney was married to Professor Jerome J. Green of Notre Dame, Ind. Professor Green has many friends in the electrical fraternity in the West, and especially in educational circles.

A. H. McDonald, a foreman of the Northwestern Telephone Exchange company, while putting in a switchboard at New Ulm, Minn., was taken sick with pneumonia and died after a few days. The remains were taken to Chicago for burial.

G. F. Greenwood, formerly chief engineer and now consulting engineer of the Consolidated Traction company, Pittsburg, Pa., has been appointed engineer in charge of rebuilding the street railroads in Havana. There are at present about 25 miles of track in that city. The New York and Canadian syndicate, which has obtained control, proposes to begin work in the fall on rebuilding and extending the present roads.

H. P. Clausen, the widely known telephone expert, has resigned his position with the Western Telephone Construction company to take charge of the multiple-switchboard work of the American Electric Telephone company of Chicago. Mr. Clausen has had charge of the engineering department of the Western company for the last five years, and during that time has been connected with some of the most difficult pieces of work handled by the Western company. Mr. Clausen is one of the leading telephone engineers in the United States, and is well known as the author of many instructive articles on telephony.

Tom L. Johnson, the street-railway magnate, recently visited Lansing, Mich., to speak before the state Legislature in favor of a bill for single tax. The railway magnate's arguments were so convincing that the senators became somewhat alarmed. But few of them had the necessary information to combat the arguments, and yet did not wish to pass the bill. Johnson was asked why personal property was omitted from the list of taxable goods and chattels. He said: "If you tax the bonds you tax twice. It is like taxing the house and taxing the deed." He declared himself ready to answer any question put to him, but had few suggestions. He reviewed the whole single-tax argument from end to end, speaking with a wealth of illustration for several hours.

ELECTRIC LIGHTING.

Sealed proposals are being invited until July 7th for furnishing and installing an electric-lighting plant at Fort Point, Cal. Information will be furnished upon application to Major Chas. E. L. B. Davis, Flood building, San Francisco, Cal.

The Treasury Department is inviting sealed proposals until June 28th for installing an electric-light and power plant in the United States postoffice and sub-treasury building at Boston, Mass. Specifications and plans can be obtained upon application to the Treasury Department, Washington, D. C., or to the custodian of the building at Boston.

ELECTRIC RAILWAYS.

It is said that one of the American attractions at the Paris Exposition will be a trolley line six miles long from the America landing to the national building down the Seine.

It is reported that the big deal for a combination of interurban electric-railway interests in and about Indianapolis has been completed, and within six months Indianapolis, Anderson, Marion, Muncie, Elwood and Summitville will be in closer connection with each other through the medium of electric lines all operated by one syndicate. The road from Indianapolis to Muncie will be completed before January 1st, if present plans carry. The firm of Campbell, Wild & Co. of Indianapolis is said to be financing the deal, and some big capitalists are interested in the enterprise, including some of the men who belong to the Indianapolis Street Railway company, which recently secured a franchise for 34 years. Ex-Congressman Charles L. Henry, owner of the Anderson road, and George F. McCullough, owner of the Muncie road, are in the new deal. The combined company will probably be called the Union Traction company. It is the intention to charge one cent a mile for passenger traffic. The system, when completed, will control 100 miles of interurban and 50 miles of city lines.

AUTOMOBILES.

The St. James Gazette says that there is no doubt that the old style of London cabman is doomed. Not only has he to contend with the taximeter, but the yellow electric cabs, after a brief interval of retirement, are to burst upon the streets once more to the number of 80. "London is so overdone with cabs," says the Gazette, "that the addition of 80 new ones to the existing total is a serious matter, especially when the four-score are of a novel and attractive kind. These electric hackney carriages are comfortable, and have only two drawbacks—they are (or were) a trifle noisy, and they attract rather too much public attention. The works, we understand, have now been simplified, and as they increase in number and familiarity the occupants will not get stared at quite so unmercifully."

PUBLICATIONS.

Five recent publications of the Westinghouse Electric and Manufacturing company not previously noticed in the Western Electrician are catalogue bulletins relating to "Transformer Fuse Blocks," "Shallenberger Integrating Wattmeters for Alternating-current Circuits," "Single-reduction Railway Motor," "Generators and Rotary Converters for Electrolytic Work" and "Belt-driven Railway Generators." All supersede earlier publications and are sent on request.

TECHNICAL SCHOOLS.

At the recent commencement exercises at Columbia University, New York, 26 students received the degree of electrical engineer. The total number of degrees conferred was 470.

The Bulletin of the College of Engineering of the University of Minnesota was issued recently. It may be had without charge on application to the Registrar, University of Minnesota, Minneapolis, Minn.

The Polytechnic Institute of Brooklyn graduated three bachelors of science in electricity and one electrical engineer on June 13th. At the annual dinner of the alumni association of the institute it was announced by Henry Sanger Snow, who recently was elected to succeed Dr. Cochran as president, that, contrary to the prevailing idea, he had not accepted the place as a permanent office, but only temporarily. Another interesting statement in regard to Mr. Snow's relation with the office was made by Prof. Brainerd D. Kellogg. He said that Mr. Snow had accepted the office on the understanding that he should not receive one cent of salary, as well as that he should remain only temporarily at the head of the faculty.

POWER TRANSMISSION.

An Albany dispatch says that Colonel John N. Partridge, state superintendent of public works, will grant permission to the Hudson River Power Transmission company to erect poles and string wires along the Erie Canal, provided the state is permitted to place telephone and telegraph wires along the poles. The power company, in its letter to the Canal Board, asks permission to string the wires on the state property from the north line of the village of Mechanicsville, south to the end of the Champlain Canal, and thence along the Erie Canal to and into the city of Albany, and as far as the Erie Canal extends.

The Westinghouse Electric and Manufacturing company has received a contract from the Big Creek Power company, Santa Cruz, Cal., for an addition to its plant. The company has already installed generators amounting to 400 horse power, and is now adding a new generator of 250 horse power, as well as four raising and lowering transformers of 400 horse power. This company is a considerable distance from the city of Santa Cruz, and transmits electric current at 10,000 volts to the city, where it is reduced and used for lighting and power purposes. This company has utilized the water power provided by the falls in the neighborhood of the city.

MISCELLANEOUS.

Consul Fowler sends to Washington from Chefoo a letter written by a merchant who has been investigating the alleged deposits of mica in China. A great abundance of the mineral is found in Chu-Cheng, and it is said to be of excellent quality.

The Treasury Department is inviting sealed proposals until June 30th for the installation of a system of conduits and wiring for electric lighting in the United States postoffice building at Brockton, Mass. Plans and specifications can be had upon application to H. A. Taylor, assistant secretary of the treasury, Washington, D. C.

The Treasury Department opened bids for the installation of an electric-light and power plant in the United States postoffice building at Cincinnati, O., of which the following were the lowest: Generators, General Electric company, Schenectady, N. Y., \$3,050; engines, Ridgeway Dynamo and Engine company, Ridgeway, Pa., \$4,125; switchboard and wiring, L. F. Buchanan & Co., Philadelphia, Pa., \$0,760.

TRADE NEWS.

The Western Electric company has furnished the Calumet Printing company, Chicago, a 40 horse-power motor to operate its printing presses. The construction department of the Western Electric company installed the plant.

Announcement is made that the E. L. Powers company of New York has effected an arrangement for the publication of the Electric Railroad List of the World, formerly issued by the Railroad Gazette. The publication will be consolidated with the American Street Railway Directory.

Among the recent sales reported by Gates & Randolph of Chicago are the following: One 150-kilowatt 200-revolution direct-current Triumph machine to Braun & Fitts of Chicago; one 150-kilowatt Warren alternator to the Manistee, Mich., Electric Light company; one 60-kilowatt Warren alternator to the Bayfield Electric Light company, Bayfield, Wis., and one alternating-current Sterling arc machine to Armour & Co. of Chicago.

Col. J. H. Shay, who recently connected himself with the Chicago Belting company, is meeting with well-earned success in his new capacity. During a trip of three weeks' duration Colonel Shay secured orders amounting to over \$9,000. The Chicago Belting company, which manufactures the well-known "Dynamo brand" of belting, states that the demand for its belting has been so great that its capacity has been taxed to the utmost to meet it.

Convincing proof of the general acceptance of the Sturtevant system is presented in the pamphlet just issued, entitled "Twenty-five Hundred Witnesses," and containing the names of public institutions of all classes and commercial enterprises in which apparatus manufactured by the B. F. Sturtevant company is now regularly employed. Some idea of the magnitude of the industry and the high standing of the Sturtevant company can be gained from a perusal of this list of names and the uses to which the apparatus is put.

William Roche, manufacturer of New Standard dry cells, is doing a splendid business in his line. The increasing demand for the cells is remarkable. Mr. Roche started out on his own account and under his own name only a little over a year and a half ago, after building up a reputation for cells made for other concerns. Mr. Roche states emphatically that the number of cells he has made to the present, under his own name, will in a couple of years bring him reputation that will endure and ought to bring him a fortune at the same time. He claims that it is the most durable telephone dry cell ever made.

Trotter's Mona Manufacturing company, limited, of New York, has placed upon the market within the last few months a compound which is fully guaranteed to be a perfect lubricant and spark preventer. Prof. J. W. Trotter, the inventor of this preparation, is a well-known manufacturer of high-grade toilet soaps and perfumes. He has been an engineer for more than 20 years, and is familiar with electrical machinery. His long and practical experience was of invaluable assistance to him in preparing this new compound. He will furnish a sample on application. Messrs. Goldmark & Wallace of 121 Worth street, New York, have accepted the selling agency of this compound.

The Renew Lamp company of 126 State street, Boston, is doing a thriving business throughout the East, renewing burned-out incandescent lamps. Not satisfied with its handsome trade in the home territory, the Renew company is planning a western campaign and proposes to locate a branch office in Chicago just as soon as the proper man to take charge of it has been secured. As the saving effected through the renewal of incandescent lamps by the Renew company is figured to be no less than one-third in the maintenance of a customer's supply, one can readily appreciate that the company can present a proposition that merits the consideration of every central-station and isolated-plant manager interested in making or saving money, and particularly so in this case, as the Renew Lamp company guarantees its product to be equal to any standard new lamp made. Treasurer Henry Hastings or another representative of the Renew Lamp company expects to visit Chicago with the view of establishing an office in this city about the middle of July.

The Westinghouse Electric and Manufacturing company's Chicago office has secured a contract from the Fox River Electric Railway company, Green Bay, Wis., for an addition to its plant. The company is placing in its power house a 135 horse power Westinghouse "engine-type" generator, connected to a new steam engine. This is an addition to the generators already installed. The company is extending its line and putting on new cars between Green Bay and Depere, which presents a very pleasant trip during the summer months. The Westinghouse company has also received a further contract from the San Gabriel Electric company, Azusa, Cal., for an additional rotary converter of 550 horse power. This unique plant, generating electricity by water power and transmitting it at 10,500 volts, is gradually supplying current to the whole of the neighborhood. The new machine is employed to supply electric current to the street railroads of Los Angeles. The San Gabriel plant now consists of one

325 horse power two 300 horse power and two 250 horse power rotary converters. As the demand for electric power are found the necessity of providing to meet the demand.

BUSINESS.

The Burnley Battery at Mansfield, a member of Painesville, O., has the reputation of being the best phone men for its Pioneer dry battery, which is perfected by long experience and is absolutely reliable. The same company makes the Burnley soldering paste.

Gentle zephyrs from electric fan trucks represent luxury on the Monon Route fast train between Chicago at 2:45 a. m. for Indianapolis and Cincinnati. Sleepers are ready for occupancy at Dearborn station at 9:30 p. m. Tickets may be had at the ticket office, 232 Clark street, Chicago.

The Swarts Metal Refining company of Chicago, in addition to buying up old copper wire, supplies the electrical trade with its high-grade Babcock cotton waste, solder, etc. The company has worked up a large trade in these lines, and users may find it to their advantage to communicate with the Swarts company.

The Montauk Multiphase Cable company will soon have ready for issuance a revised price-list. This has been made necessary, owing to the recent advance in metals. All price-lists heretofore issued are subject to this revision. A new book will give data for specifications and plans of buildings showing the installation of the cables; also directions for installing.

Economy of operation, reliability of action and smallest danger element are requisites in electric lighting. The Zeco enclosed direct-current arc lamps are gratifying to central-station people because giving their customers all that modern constant-potential arcs can render in reliable results. The Central Electric company, Chicago, distributes these articles of proven merit.

The Valentine-Clark company of Chicago states that the demand for cedar poles was never as large as it is at present, and that it finds it difficult to fill its orders. The company is one of the best-known pole concerns in the United States, and bears an enviable reputation among users of poles. Its yards at Pinconning, Mich., Green Bay, Wis., and New London, Wis., are said to contain a larger stock of cedar poles than those of any other dealer.

The wonderful endurance of a well-designed and thoroughly constructed fan blower is shown by a recent statement of William Kennedy & Sons, Owen Sound, Can., to this effect: "We have two Sturtevant pressure blowers in use, one of which has run over 32 years steady, and often 24 hours per day, and is apparently as good as when installed, although no one has as yet seen the inside of it. The other has been used for foundry purposes, and has been in use for about 30 years or so."

The demand for telephone and line material during the past spring has been so heavy that it has only been with the greatest difficulty that the large supply houses have been able to keep up with the demand. This has given the Electric Appliance company of 92 and 94 West Van Buren street, Chicago, an opportunity to test the facilities of its new building, and it has been able to handle a business in the line of telephone-construction material that would have been absolutely impossible if its facilities were not of the highest order.

The Mica Insulator company of New York, Chicago and London reports a heavy increase in the volume of business during the last two months. The company's line of insulating material—Mica plates, segments, rings, etc., Empire insulating cloths and papers and M. I. C. compound—is being used extensively by the leading builders of electrical machinery throughout the United States and European countries. The company's Micaite segments are now in use, it is said, by nearly all the large builders of generators and motors. Those having had no experience in the use of Micaite are asked to correspond with the company at New York, Chicago or London.

The Westinghouse Electric and Manufacturing company has received a contract from the St. Louis Dressed Beef company to install a 600 horse power engine-type electric generator to be directly connected to an engine, and to install a millstone switchboard. The St. Louis Dressed Beef company is adding to its electrical plant for the purpose of generating increased light to the cooling rooms. The Rockwell Electric company of Cincinnati has secured from the Westinghouse Electric and Manufacturing company one 150-kilowatt generator. The Philadelphia and West Chester Traction company, Philadelphia, has contracted with the Westinghouse Electric and Manufacturing company for six additional equipments of 35 horse power each. Each of these cars will therefore be driven by four motors aggregating 140 horse power. They are being especially built for the summer months, and are now fully finished, are on exhibition at the pleasure seekers and excursionists. W. H. Taylor & Co. of Worcester, Mass., have ordered a considerable electrical equipments for street railway cars. Each car will have two motors aggregating 100 horse power each.

ILLUSTRATED ELECTRICAL PATENT RECORD.

Issued June 13, 1899.

626,661. Electric-arc Carbon. Daniel Bacon, New York, N. Y. Application filed January 13, 1898.

An electric arc-lamp carbon having a longitudinal groove or opening extending inwardly as far as the circumferential line of the crater or arc which will be formed during the use of the carbon, but not to the center or axis of the carbon.

626,667. Electric Sign. Charles A. Chase, Chicago, Ill. Application filed March 29, 1899.

An electric sign comprising a base board provided with a series of slots or open spaces, a series of letters comprising electric lights arranged to form the contour of the letter, the letters attached to the face of the board to form the desired sign, suitable electrical conductors attached to the back of the board, and suitable connections extending from the conductors through the slots or open spaces to the letters.

626,670. Electrical Burglar-alarm. Clyde Coleman, Chicago, Ill. Application filed November 10, 1896. Renewed November 28, 1898.

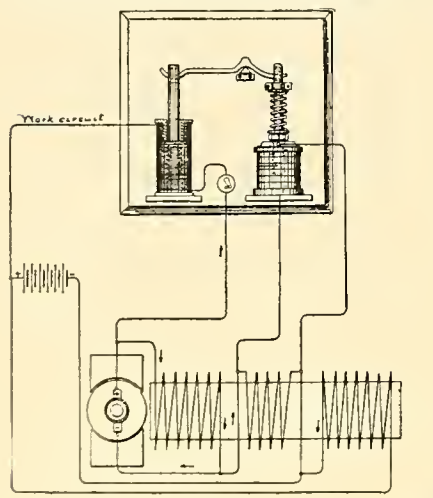
One claim is given: In an electrical burglar-alarm system the combination of a main circuit, a door circuit, means located at the guarded structure and adapted to be operated manually from the outside of the structure for electrically connecting the door circuit with the main circuit, a responsive device electrically connected with the main circuit and adapted to operate upon a disturbance of the door circuit when the latter is connected with the main circuit, automatically operating means for establishing for the current a path other than the door circuit, and means for thereafter preventing a disturbance of the responsive device by a disturbance of the door circuit, the system being without any means at the guarded structure, accessible from the outside thereof, and adapted to be operated manually for thus establishing the path other than the door circuit.

626,684. Electrical Safe-protection System. Henry F. Freed, Harrisburg, Pa. Application filed December 13, 1898.

In an electrical safe-protection system there is the combination with the safe, its biased door and locking bolts, of an electrical circuit having its terminals extending within the safe and in the path of the door electrical alarm mechanism forming a part of the circuit, a knob spindle fixed to the door, a key-operated lock contained within the knob spindle and operatively connected to the locking bolts and adapted to interrupt the circuit.

626,713. Self-regulating Dynamo. Morris Moskowitz, Newark, N. J. Application filed October 4, 1898.

A dynamo-electric machine, subject to variable armature speed, has a self-excited field coil in shunt with its armature, a high-resistance coil wound around the field of the dynamo, fed from a battery in circuit with the high-resistance coil, and a differential-series coil in the main circuit with the armature of the dynamo, the high-resistance coil coacting with the self-excited field coil to maintain or increase the field magnetism of the dynamo.



NO. 626,713.

626,723. Electricians' or Plumbers' Torch. Hiram C. Roberts, Philadelphia, Pa. Application filed April 17, 1899.

An electricians' and plumbers' torch consisting of a body provided with a wick tube, keepers mounted on the body, an air nozzle, the upper end of which is turned and adapted to discharge a blast in the vicinity of the upper end of the wick tube, which nozzle is movably mounted in the keepers, and a spring disposed between the body and nozzle and bearing against the air nozzle.

626,769. Apparatus for Electrically Annealing Wire or Rods. James H. Preston, Joliet, Ill. Application filed October 12, 1898.

Sheave wheels and means for electrically connecting them are arranged so that the means for opening and closing the switch and the sheave wheels are adapted to have electric contact with the wire or rod to be annealed and thus form an electric circuit over the wire flowing in each direction.

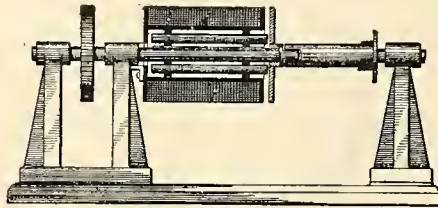
626,787. Electrode. William E. Irish, Cleveland, Ohio. Application filed January 3, 1898.

The method described of substituting an incandescent medium for an arc in an arc lamp, consisting in first turning the circuit through the arc, heating by means of an incandescent medium connecting the carbons, and making the medium conductive, when previously partially non-conductive, and finally maintaining the circuit through the medium to the exclusion of the arc, and increasing the incandescence of the medium thereby.

626,809. Coin-controlled Telephone-register. Tobias J. Hock and Emil Happersberger, San Francisco, Cal. Application filed July 20, 1898.

located in a single circuit and means are provided for transmitting electrical impulses through their coils, one arranged to act quickly and the other slowly in response to the impulses, in combination with a series of contact terminals, a movable arm traveling in the path of the contact terminals without touching them, the movement of the arm actuated by the quick magnet, and devices for bringing the arm in contact with the selected terminal actuated by the slow magnet and brought into action by a momentary stoppage of the impulses.

A series of registering disks, a pawl-carrying lever fulcrumed so that by its forward and backward movement it advances the disks to register the movements, a pawl-and-ratchet mechanism by which the lever is prevented from returning until the forward motion is completed, a latching lever by which the lever is retained in its normal position when it has been returned thereto, the latching lever being disengaged when a coin is introduced into the apparatus.



NO. 626,809.

626,826. Telephone Circuit. Percival G. Burgess, Mexico, Mex., and Henry W. Wilder, Springfield, Mass. Application filed March 16, 1899.

In a telephone system the combination of three differently placed telephones, a circuit including two of the telephones in such manner that each may transmit to and receive from the other, and a second circuit formed in part of a portion of the first, including one of the telephones, and in part of an auxiliary conductor joining two equipotential points of the first circuit, and including the third or remaining telephone, the third telephone being thereby adapted to transmit to one of the two telephones of the first circuit but not to the other.

626,832. Electric Meter. Edward S. Halsey, Chicago, Ill. Application filed May 23, 1898.

This is a mercurial meter in which pole-pieces present to each other surfaces widest at their centers, and tapering toward the ends so as to establish in the slot between them a magnetic field broadest at the center and narrowing toward the ends, the pole-pieces being of small area compared to the armature rotating between them and small electrodes centrally located at each end of the pole pieces.

626,833. System of Electric Metering. Edward S. Halsey, Chicago, Ill. Application filed July 1, 1898.

A multiple electric metering system is applied to a three-wire distributing system; at each point of consumption or metering a dial shifter or switch is operated by a current sent from the central station, passing through coils of wire acting upon a polarized element of shifter, the direction of the current through the coils determining the direction of movement of the operation, both operations being performed by the same coils, all of the coils being connected to and branching from a neutral wire of the distributing system.

626,835. Electric Block System for Railways. George Knowles, Milwaukee, Wis. Application filed December 26, 1895.

A main supply conductor and auxiliary conductors and circuit-controlling devices consisting of switch arms connected in pairs by an auxiliary conductor, two contacts associated with each switch arm and connected one with the main conductor and the other with the ground or return, and instruments arranged to be operated by cars passing successively in the same direction or in opposite directions to shift the switch arm of the associated switch alternately from engagement with one contact into engagement with the other.

626,848. Electrical Measuring Instrument. Joseph Wills, Niagara Falls, N. Y. Application filed November 3, 1898.

In an instrument for recording electrical energy there is the combination with the record-making mechanism of a coil traversed by alternating currents and acting magnetically to produce mechanical vibrations of one of the members of the recording mechanism.

626,918. Electrical Switch. Paul Medary, Cynwyd, Pa. Application filed September 2, 1898.

Provision is made for the combination with an insulating block having hollow terminals at the opposite ends of a reciprocating push rod passing through the block and terminals having metallic bushings thereon and an interposed insulating sleeve, each formed with pockets in their outer faces, and spring pressed balls secured in the terminals and arranged to engage in the pockets.

626,919. Electrical Switch. Paul Medary, Cynwyd, Pa. Application filed November 30, 1898.

An insulated block has oppositely arranged terminals secured thereon; a reciprocating push rod has oppositely arranged terminals and an insulated section; a substantially triangular projection carried by the rod and projecting into the block and spring-pressed member in the block are arranged to engage the projection during the movement of the rod.

626,927. Incandescent-lamp Socket. Charles G. Perkins, Hartford, Conn. Application filed February 13, 1899.

A cap, shell, insulating material located within the shell, fastening plates loosely connected with the insulation, fastening screws extending through the cap and shell and the fastening plates, and binding posts and contacts held by the insulation are combined.

626,940. Electric Cable. Willoughby S. Smith, London, England. Application filed November 7, 1898.

The combination of a single solid metallic conductor

and tapes of the same metal as the conductor helically wound on it, and in electrical connection with it, the diameter of the central conductor being largely in excess of the thickness of the tape, or their combined thickness, when two or more layers are used.

626,942. Magnet Clutch for Brakes. Joseph B. Stewart, Haverstraw, N. Y. Application filed November 4, 1897.

An electromagnetic clutch comprising a shaft, supports mounted thereon and carrying a number of bars loosely mounted in the supports and forming a core, a coil surrounding the core and rigidly supported with relation to the shaft, and an armature loosely mounted on the shaft and connected to the brake-operating mechanism.

626,972. Electrolytic Apparatus for Deposition of Metals from Solution. Thomas Craney, Bay City, Mich. Application filed January 3, 1898.

Claim is made for the combination of the outer tank, an overflow pipe therefrom, a hollow open-ended feed pipe in the center of the tank, and an anode and cathodes mechanically combined therewith and forming with it a removable unit of the apparatus.

626,978. Electrical Arm Signal for Railway Crossings. William H. Daniels, Berea, and Aaron E. Flickinger, Elyria, Ohio. Application filed December 31, 1897.

Two normally closed track circuits include electrically insulated track sections at opposite sides, respectively, of the crossing, and electromagnets; a normally open electric circuit includes magnets and an armature that is normally attracted by one magnet and capable of closing the break in the circuit when it is moved away from the magnet; another normally open electric circuit including magnets and an armature that is normally attracted by a magnet and capable of closing the break in the circuit.

626,979. Rail-bond for Electric Railways. Fred H. Daniels, Worcester, Mass. Application filed November 25, 1898.

A rail bond in which the terminals are combined with a flattened wire rope or cable connector enlarged or bulged at a point between its ends so as to spread apart and loosen up the several strands, the enlarged portion being also flattened, with its strands in their spread-apart condition.

626,980. Rail-bond for Electric Railways. Fred H. Daniels, Worcester, Mass. Application filed April 25, 1899.

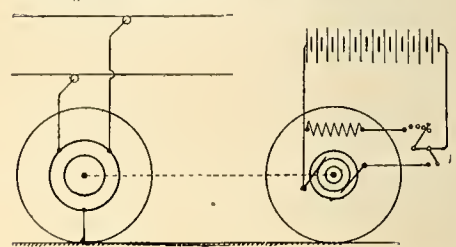
This improvement in the manufacture of rail bonds or connectors for electric railways consists in forming from strands of copper wire a tubular rope or cable, and then flattening the rope or cable by pressure.

626,983. Automatic Telephone-exchange System. Ward Decker, Owego, N. Y. Application filed August 3, 1896.

In an automatic telephone or other electrical exchange system the combination is claimed of switch-operating electromagnets at a central station, metallic circuits radiating to substations, means for operating the switching magnets at the central station consisting of a motor-driven magneto-electric generator, generating alternating currents at each substation, and controlled by a dial, and a movable plug for controlling the dial.

626,984. Combined Alternating Continuous-current System for Electric Traction. Max Déri, Vienna, Austria-Hungary. Application filed April 27, 1897.

A car carries an alternating-current motor to operate the train and a continuous-current dynamo or motor is also connected mechanically to an axle or wheel of the car or train, with an accumulator battery electrically connected up to the direct-current dynamo or motor, and interrupted line conductors supplying alternating currents to the alternating-current motor.



NO. 626,984.

627,006. Electrical Burglar-alarm System. Henning O. Megaard, Chicago, Ill. Application filed February 1, 1897. Renewed November 28, 1898.

The combination with the structure to be guarded and a curtain for closing the opening thereto of an electrical burglar-alarm system having an electrical barrier disposed upon the curtain, the structure to be guarded being provided with portions which project in front of the curtain so as to overlap and conceal its edges and which project beyond the edges of and overlap the electrical barrier on the curtain.

627,000. Storage Battery and Method of Preparing Electrodes Therefor. Leonard Paget, New York, N. Y. Application filed May 1, 1899.

A storage-battery electrode in which finely divided active material forms the sole conducting connection between the opposite sides of the electrode, the opposite sides of said active material consisting of oxidized and oxidizable material, substantially as described.

627,054. Electrical Burglar-alarm System. Clyde Coleman, Chicago, Ill. Application filed October 18, 1897.

A device for opening and closing a circuit has a rock shaft, mercury cups carried thereby, an armature, an electromagnet for moving the armature in one direction and thereby moving the rock shaft with its cups, and an automatic mechanical device having a trip adapted to move the shaft in the opposite direction.

Western Electrician

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SIMPLEX INSULATED WIRES AND CABLES.
 RUBBER COVERED. WEATHERPROOF. UNDERGROUND AND SUBMARINE.
 WESTERN SELLING AGENT: **Simplex Electrical Company,**
 H. R. HIXSON, 1127 Montross Bldg., CHICAGO. 75-81 Cornhill, BOSTON, MASS.

ALFRED F. MOORE,
 MANUFACTURER OF
INSULATED ELECTRIC WIRE,
 FLEXIBLE CORDS AND CABLES.
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1889—Paris Exposition, Medal for Rubber Insulation.
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THE STANDARD FOR RUBBER INSULATION.
 Sole Manufacturers of
 Okonite Wires, Okonite Tape, Manson Tape, Candee Weather-proof Wires.
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THE "AMERICAN" FUEL ECONOMIZER
 THE BEST IN THE WORLD.
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 GREEN ENGINEERING CO., 518 Western Union Building, Chicago, Ill., Sales Agents for Chicago and Vicinity.


Insulating Paint & Varnish.
 We were the first chemists in the world to make a special study of this problem. Our long experience and careful investigation enables us to be of service to wide-awake electricians.
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 Boston, Mass., U. S. A.

The Brady Mast Arms.

 T. H. Brady, New Britain, Conn., U. S. A.
 Manufacturer of Mast Arms, Pole and Swinging Hoods, House Brackets and other Specialties for Construction Work.—Catalogues and Prices furnished on application.


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 HAVE YOU A COPY OF OUR No. 8 CATALOGUE? IF NOT, SEND FOR IT.
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 Acme Testing Sets, Queen-Wirt Switchboard Instruments, X-Ray Focus Tubes, Induction Coils.


 Most Interesting & Useful English Made.
Electric Beam Engine
 for testing
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 Sent prepaid on receipt of \$1.50.
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CIRCUIT BREAKERS
 CUTTER ELECTRICAL CO., PHILADELPHIA

Standard Underground Cable Co.

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Electric Cables, Conduits, Wires and Accessories,
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 Central Electric Co., 204 Fifth Ave. Chicago.
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TIPLESS LAMPS

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Illuminated Dial Station Instruments.

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 Portable Direct Reading Voltmeters and Millivoltmeters. Ammeters and Milliammeters. Wattmeters and Voltmeters, for Alternating and Direct Current Circuits.
 Our portable instruments are recognized as standards throughout the civilized world.
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 They are the most reliable, absolute standards for Laboratory use.
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 Mention the WESTERN ELECTRICIAN when writing for catalogues.

VICTOR and IDEAL
Circuit Breakers.
F. A. LA ROCHE & CO.,
 652 Hudson St., New York.
 All Copper Switches, Automatic Switches, Switchboards and Panel Boards.
Motor Cut-Outs and Other Specialties,

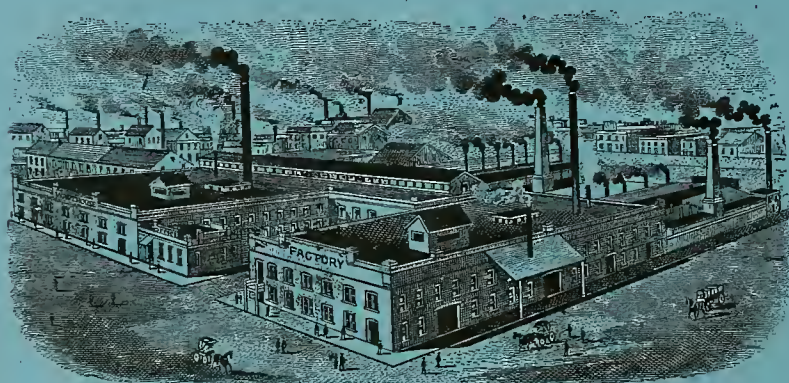
THIS DRY BATTERY

Is constructed on Principles
entirely new, and is
named



PROGRESS.

WRITE US
FOR
SAMPLES.



WRITE US
FOR
SAMPLES.

It has the Highest E. M. F.
It has the Lowest Internal Resistance.
It has the Largest Ampere Discharge.
It has the Quickest Recuperation of any Dry
Cell ever made.
Can be renewed at a small cost, and is abso-
lutely reliable.



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"Chloride Accumulator"

REGISTERED SEPTEMBER 11, 1894.

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CANADA, The Canadian General Electric Co., Limited, Toronto, Ont.

TO STREET RAILWAY MANAGERS:

If you are considering an increase in the capacity of your station, or an extension of your lines,

INVESTIGATE THE CHLORIDE ACCUMULATOR

and the results it is producing. Its use means a maximum efficiency of the power plant with a minimum investment in generating units and copper.

THE ELECTRIC STORAGE BATTERY CO.,
Drexel Building, Phila., Pa.

CATALOGUES.

New Standard Dry Battery

FOR ALL OPEN CIRCUIT WORK.

Adopted as STANDARD by U. S. Naval Experts,
AND USED IN THE WAR WITH SPAIN.

Prices will Suit, and Quality is Superior to All Others.

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STERLING VARNISH COMPANY, 325 Water St., Pittsburg, Pa.

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For High Potential Power Transmission

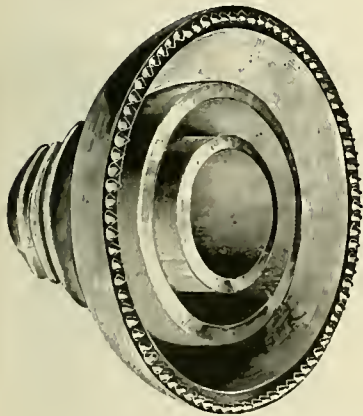
—USE—

"PROVO TYPE" HIGH POTENTIAL INSULATOR.

This Insulator was designed by V. G. Converse, E. E., for the Telluride Power Transmission Company of Provo, Utah. It has been in successful operation for more than a year at Mercur, Colo., carrying a current of 40,000 volts. Manufactured and guaranteed by

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HARDTMUTH CORED AND SOLID CARBONS

FOR DIRECT CURRENT ARC LAMPS.

WE HAVE IN STOCK THE FOLLOWING SIZES:

CORED CARBONS.

Diameter. Length.
 5-16 in. x 6 in., 6½ in., 7 in., 7½ in. and 8 in.
 3-8 in. x 7 in., 8 in., 9 in., 9½ in., 10 in. and 12 in.
 7-16 in. x 6 in., 7 in., 8 in., 9 in., 9½ in., 10 in. and 12 in.
 1-2 in. x 6 in., 7 in., 7½ in. and 8 in.
 5-8 in. x 12 in.

SOLID CARBONS.

Diameter. Length.
 7-16 in. x 7 in. and 10 in.
 1-2 in. x 6 in., 7½ in. and 12 in.

Having received a large consignment of these Carbons just before the new tariff went into effect, we are prepared to make very low prices. Send for price list.

CHICAGO EDISON COMPANY,

EDISON BUILDING, 139 ADAMS STREET, CHICAGO.

VICTOR CIRCUIT BREAKER.

F. A. LA ROCHE & CO., 13th and Hudson Streets, NEW YORK.



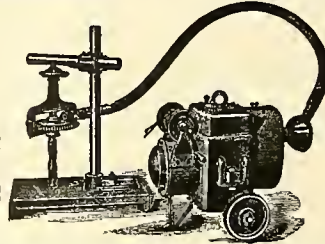
American Electrical Heater Company,

MANUFACTURERS OF

ELECTRIC SOLDERING IRONS,

TAILORS' IRONS, LAUNDRY IRONS, HAT IRONS, CURLING IRON HEATERS, ETC. Also other Devices for Electrical Heating.

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ESTABLISHED 1875

COMBINATION OF

Stow Flexible Shaft

—AND—

IRON CLAD ELECTRIC MOTOR.

Practically dust and water proof. For Portable Drilling, Tapping, Reaming, Emery Grinding, etc. Write for Catalogue and Prices.

STOW MFG. CO., Binghamton, N. Y.

Gen'l European Agents, Selg, Sonenthal & Co., 85 Queen Victoria Street, London, England.

GREETINGS OF THE SEASON! HAVE YOU TRIED OUR

SINGLE-PHASE MOTORS! TRANSFORMERS.

Instruments—Direct and Alternating!

SWITCHBOARDS—FOR LIGHTING, STREET RAILWAY,
POWER, ARC AND ISOLATED PLANTS.

DIRECT-CURRENT MOTORS AND GENERATORS. VENTILATING
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GENERAL OFFICES AND FACTORY: ST. LOUIS, U. S. A.

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Boston, 820 Atlantic Ave., Henry M. Nay, Agent.

Chicago, 1519 Marquette Bldg., Geo. B. Foster, Agent.

San Francisco, 409 Market Street, California Electrical Works, Agents.

Cleveland, B. M. Barr & Co. Agents.

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Portland, Ore., E. Darrow, Agent.

St. Louis, Central-South, Commercial Electrical Supply Co., Agents.

Toronto, Canada, W. A. Johnson, Agent.

Yokohama, Japan, Bagnall & Hillis, Agents.

London, England, C. R. Heap, Agent.



CENTRAL ELECTRIC COMPANY
OKONITE
OKONITE
CHICAGO

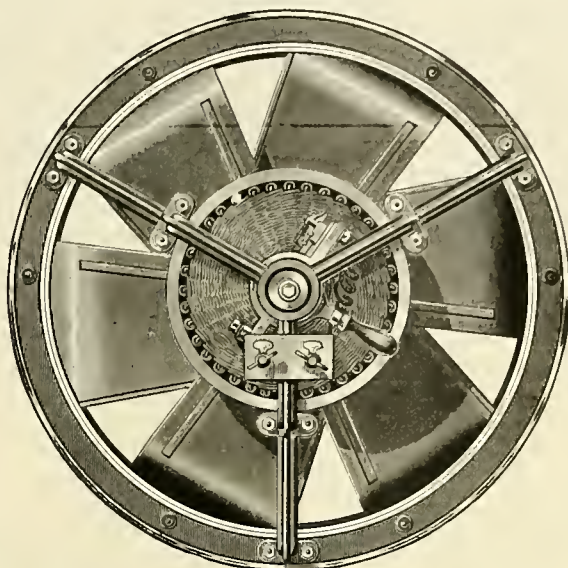
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Electric
Company
Chicago

ELECTRIC
SUPPLY
GENERAL
CATALOG

EXHAUST FANS

FOR ALL CIRCUITS, EXCEPT ALTERNATING.

For Theatres,
Hospitals,
Public Buildings,
and All Places
where
Perfect Ventilation
is Desired.



Equipped
with
Fire-Proof
Speed Regulator
of the
Most Improved
Type.

All Fans
Directly Connected
to Motors.

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Upon Application.

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SHOW ROOMS: { 561-563 Broadway, NEW YORK.
128-132 Essex Street, BOSTON.
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Main Office and Factory:

ELIZABETHPORT, N. J.

110 and
220 Volts
Direct
Current.



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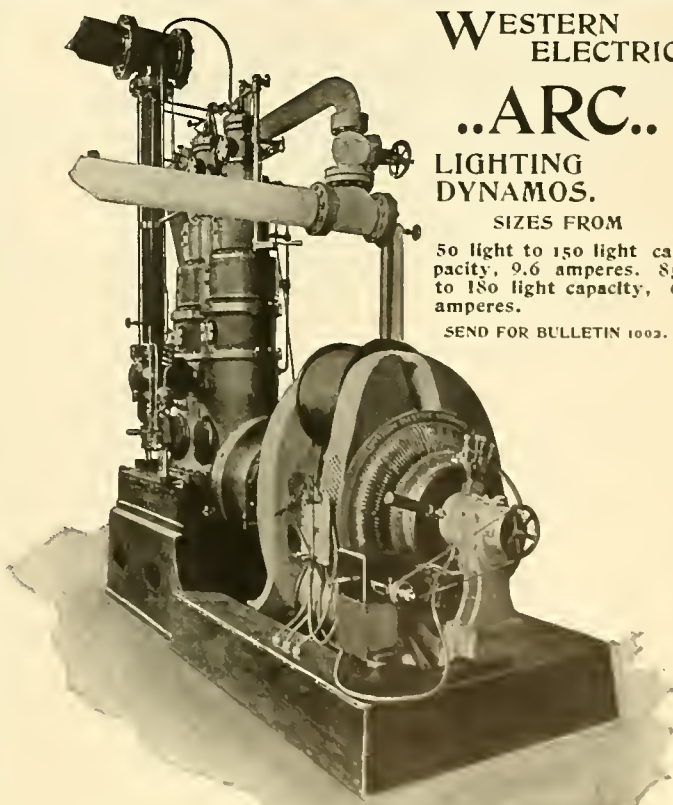
PLAIN PETITE ENCLOSED LAMP WITH OUTER GLOBE O.

Manufacturers and Dealers
ELECTRICAL SUPPLIES AND APPARATUS.

Arc and Incandescent Lighting Dynamos,
Power Dynamos and Motors,
Arc and Incandescent Lamps,
Switches, Sockets, Cut Outs,
Fan Motors, Telegraph, Testing and
Measuring Instruments, Wire, Bells,
Batteries and all Sundries Required in
an Electrical Installation.

WESTERN ELECTRIC COMPANY,
CHICAGO. NEW YORK.

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WESTERN
ELECTRIC

..ARC..

LIGHTING
DYNAMOS.

SIZES FROM

50 light to 150 light ca-
pacity, 9.6 amperes. 85
to 180 light capacity, 6
amperes.

SEND FOR BULLETIN 1002.

WESTERN ELECTRIC COMPANY.

CHICAGO.

NEW YORK.

LONDON,
79 Coleman Street.

ANTWERP,
33 Rue Boudewyns

PARIS,
45 Avenue de Breteuil.



Our Sixth Yearly Greeting

.....To Our Trade

Central Lighting Stations

Central Street Railroad Stations

Isolated Plants

Telephone Exchanges

Contractors

Engineers

Central Power Stations

Supply Dealers

Telephone Jobbers

Telegraph Companies

Fixture Houses

And All Other Patrons of the Electrical Trade.

HAPPY NEW YEAR



Our Sixth Yearly Greeting

.....To Our Factories

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K. K. Wires.

SPRAGUE ELECTRIC CO.,
Interior Coaduit—Lundell Motors.

ERICKSON ELECTRIC EQUIPMENT CO.,
Junction Boxes.

WESTINGHOUSE ELECTRIC & MFG. CO.

SAWYER-MAN ELECTRIC CO.,
Incandescent Lamps.

PASS & SEYMOUR,
Porcelain Goods.

PERKINS ELECTRIC SWITCH MFG. CO.,
Sockets and Switches.

H. T. PAISTE CO.,
Sockets and Switches.

WAGNER ELECTRIC MFG. CO.,
Transformers—Knife Switches—Apparatus.

**KEYSTONE ELECTRICAL INSTRUMENT
CO.,**
Electrical Instruments.

SCHIFF, JORDAN & CO.,
Imported Carbons.

HELIOS ELECTRIC CO.,
Helios Arc Lamps.

HART & HEGEMAN MFG. CO.,
Switches.

**AMERICAN ELECTRIC HEATING CORPOR-
ATION,**
Heating Appliances.

AMERICAN ELECTRIC FUSE CO.,
Fuses and Fuse Wire.

D. & W. FUSE CO.,
Non-Arcing Fuses.

STANDARD PAINT CO.,
P. & B. Insulating Tape and Compounds.

AMERICAN CIRCULAR LOOM CO.,
Electroduct and Circular Loom.

MESCO DRY BATTERIES.

W. T. C. MACALLEN,
Street Railway Equipment.

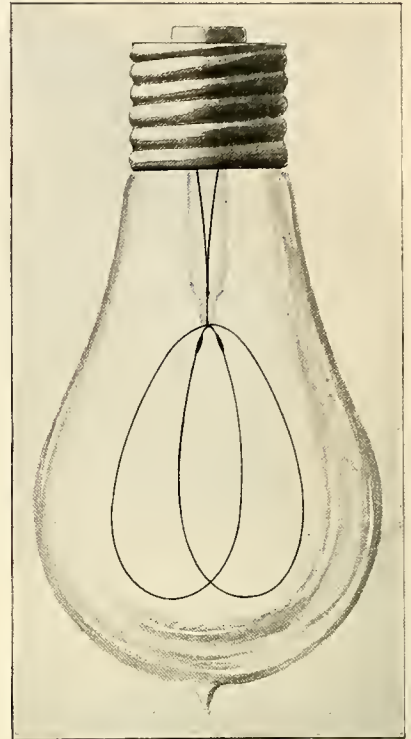
RUSSELL-ERWIN MFG. CO.,
Push Buttons.

SIMPLEX ELECTRICAL CO.,
Rubber-Covered Wires.

CLIFTON MFG. CO.,
Friction Tape.

PERU ELECTRIC MFG. CO.,
Porcelain Goods.

HAPPY NEW YEAR



PATENT APPLIED FOR.

“THAT’S the Lamp.”

THE “NEW LYNN”

The Lamp of the Century.

This oval anchored filament lamp is the finest type of lamp yet designed, and in the “New Lynn” we have it in perfection.

This lamp is all that good workmanship and the best of material can make it.

Its superior qualities make it THE LEADER.

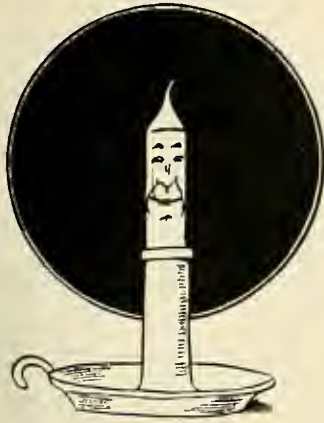
Large stock. Prompt shipments. Quality guaranteed.

All voltages, bases, candle powers and efficiencies.

Write for our method of maintaining your supply of this very superior new lamp at lowest price of any first-class lamp on the market.

LYNN INCANDESCENT LAMP CO.,
LYNN, MASS.

THE LIFE OF A TALLOW DIP
A Tragedy in Five Acts.



—Unsere Gesellschaft.

THE COLUMBIA INCANDESCENT LAMP.

**“UNEQUALED
IN QUALITY.”**

Just a Few Lines of Greeting
for the New Year.

There are now (and more will appear in 1899 without doubt!) so many “tallow dip” incandescent lamps on the market that we call your attention to the fact that a “tallow dip” lamp, like its namesake to the left, gets “sicker” and sicker as it burns until in a short time it looks (and you feel) like this:



and soon “fizzles out” like this:



You’ve tried all sorts of **cheap** lamps—have they satisfied you? NO! We know they have not. Try a good lamp in 1899—our “unequaled in quality” means something.

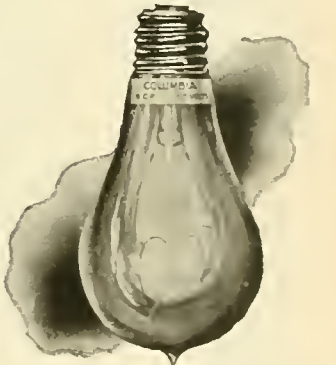
**Columbia Incandescent Lamp Co.,
ST. LOUIS.**



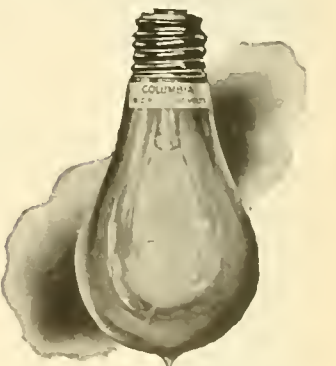
AFTER 100 HOURS.



AFTER 250 HOURS,
NOTE THE CHANGE!



AFTER 450 HOURS.



AFTER 500 HOURS.



AFTER 600 HOURS.

AN ENORMOUS MOTO-VEHICLE CONTRACT!

THE STORY OF THE SALE.

SCRAP BOOKS MADE.
Clippings furnished upon any Subject.

Bureau of Press Clippings

Chicago Office, 325 Dearborn St.
New York Office, 32 Park Row.

COMPLETE FILE CHICAGO DAILIES FOR 10 YEARS.
From _____

Automobile order creates "hull," the unprecedented order from Paris to supply a Chicago firm which has been placed with a contract to supply a large number of motor cars for the city. The order is for nearly \$2,000,000 of electric cars of the most modern workmanlike design. It is the largest order of its kind that it was in Paris that the electric motor was first used in a motor car. The firm in question is the Electric Carriage Co. of Paris. The order has been placed, said yesterday, "the reason Paris comes to this country for the electric car is that it is the only one that has not been developed, although it originated there."

Bureau of Press Clippings

Chicago Office, 325 Dearborn St.
New York Office, 32 Park Row.

COMPLETE FILE CHICAGO DAILIES FOR 10 YEARS.
From _____

Date _____ 189__

New York, Jan. 7. - A model of the new electric motor car, which has been contracted for by the city of Chicago, was displayed at the Hotel Astor today. The car is said to be the best of its kind in the world. It is a four-wheeled vehicle, and is capable of carrying a load of 1,000 lbs. It is said to be the best of its kind in the world. It is a four-wheeled vehicle, and is capable of carrying a load of 1,000 lbs. It is said to be the best of its kind in the world.



ONE OF THE VEHICLES.



ANOTHER OF THE VEHICLES.

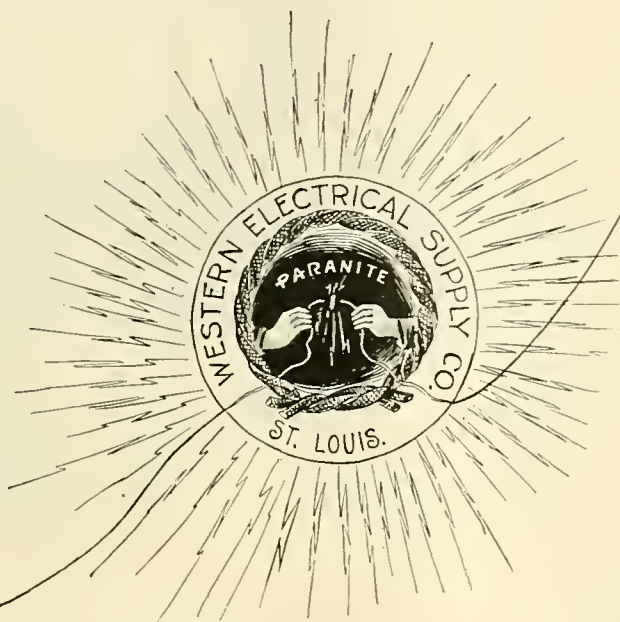
THIS SPEAKS FOR ITSELF!

FISCHER EQUIPMENT COMPANY,

110-112 East Twentieth Street,

CHICAGO, ILL., U. S. A.

Thousands of Buildings from
New York to San Francisco are
Wired with "Paranite" Wire.



NEW YORK.



SAN FRANCISCO.

Others Use "Paranite" and
"Indorse" it.
Why Not You?

WESTERN ELECTRICAL SUPPLY CO.,

ST. LOUIS, MO.

The PIONEER and LEADER in

THE
20TH
CENTURY
MOVE-
-MENT



Is the....

American Electric Vehicle Co.

OUR IMPROVED BATTERY

Reaches the up-to-date limit as a COMBINATION of the Powerful, Light and Compact.

The Best Results of Experience and SCIENTIFIC AND PRACTICAL

Experiment are embodied in our Vehicles—Power, Speed, Absolute Control, Luxurious Appointment and High Finish.

SEND FOR CATALOGUE.

The American Electric Vehicle Co.

OFFICE: 1545 Michigan Avenue. FACTORY: 1523-5 Wabash Avenue.

CHICAGO, U. S. A.

Vitogen Vitogen

The attention of Managers and Engineers of Power Plants

is particularly called to this article,
unequaled in cases of

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**No Pain.
No Odor.
No Irritation.**



Dr. Weathers,
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IND.,

Lifted out 2½ lbs.
mass of burned
flesh.

Sloughing fear-
ful.

Vitogen
to the rescue.

"Mr. Harry Rood, electrician in plant which supplies power to New Albany street car, arc and incandescent light lines, by accident brought his back in contact with switchboard of arc line which carried at the time a 4,000 voltage. He was impaled until released by the tissue being burned away in two pits down to the bone structure about 3 inches in diameter. These pits were 10 inches apart. The intervening flesh was roasted so severely that after a few weeks a mass weighing 2½ pounds was lifted out."

"Immediately after the accident I applied equal parts of linseed oil and lime water, pouring the charred cavities full and covering over with absorbent cotton. This continued for some days. Opiates administered to relieve intense pain. The sloughing was something awful—cotton, bandages, clothing and bed were swathed in pus."

"I turned my attention to dry dressing; first used boracic acid and bismuth Sub. Nit., which was conducive of too much pain."

"I then sprinkled Vitogen lightly over surface of wound and over cloth saturated with linseed oil. The effect was marked by quiet and sleep of patient without the aid of opiates. The burn was thereafter dressed with Vitogen generally twice a day. One remarkable feature was that after Vitogen was applied a few times there was no more pus, and on undressing the wound each time no Vitogen powder was visible. This mode of treatment was not departed from until September 1, when patient was discharged."

"My bill shows that I used all told 18 ounces of Vitogen in this case."

"I enclose photographs of patient's back five weeks after accident and at present time. The rib shown in No. 1 was later excised. Please note the healthy granulation shown to good advantage in No. 1. One part, as seen in No. 2, is not entirely closed. There seems to be some dead bone there, which may necessitate a second operation. However, this does not detract from the merits of Vitogen. Indeed, I feel that Vitogen merits all that I have said of it."

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IT'S WHAT A LAMP DOES THAT IS IMPORTANT.

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Cost of "FOWLER" Lamp, 20 cts.

" "CHEPE" " 15 "

Suppose they both last 600 hours—then,

Cost of "FOWLER" Lamp per hour— $20 \div 600 = \frac{1}{30}$ cts.

" "CHEPE" " $15 \div 600 = \frac{1}{40}$ "

$\frac{1}{30}$ cts.—Additional First Cost, per hour of life, for "FOWLER."

Suppose current costs 10 cts. per K.-W. hour:

"FOWLER" Lamp (high efficiency) uses $\frac{5}{10}$ cts. per hour.

"CHEPE" " (any old efficiency) averages $\frac{3}{10}$ cts. per hour.

$\frac{2}{40}$ cts.—Loss, in cost of current per hour, with "CHEPE" Lamp.

After a short time, "CHEPE" Lamp gives $\frac{1}{2}$ less light, though it takes as much current as at first— $\frac{1}{2}$ of $\frac{2}{40}$ cts.

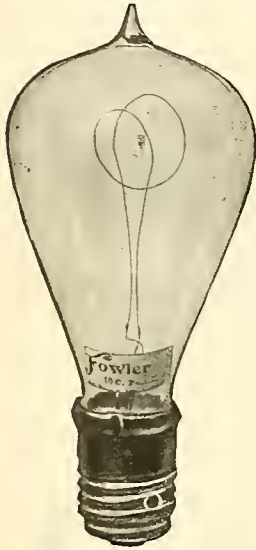
$\frac{2}{40}$ cts.—Loss in light per hour with "CHEPE" Lamp.

$\frac{1}{40}$ cts.—TOTAL AMOUNT YOU LOSE EVERY HOUR YOU USE A "CHEPE" LAMP. Multiply $\frac{2}{40}$ cts. by 600=\$2.65—net amount you lose by every "Chepe" Lamp which lasts 600 hours.

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Is worth more after it is burned out, as base is not clogged up with plaster but may be detached and used again.

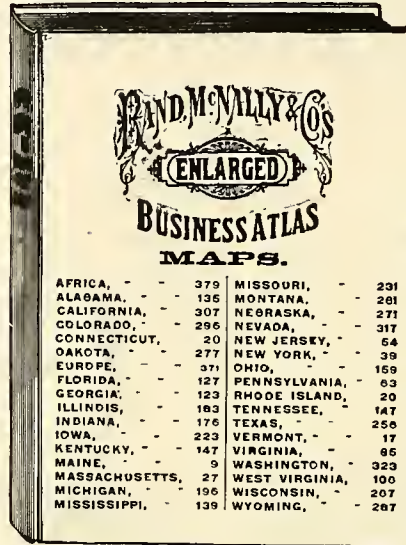
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This Cut shows only a few of the Maps contained in Atlas, merely to explain appearance of book. On the cover of the Atlas all States are indexed.

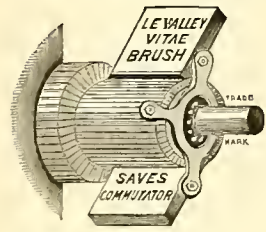
AFRICA	379	MISSOURI	231
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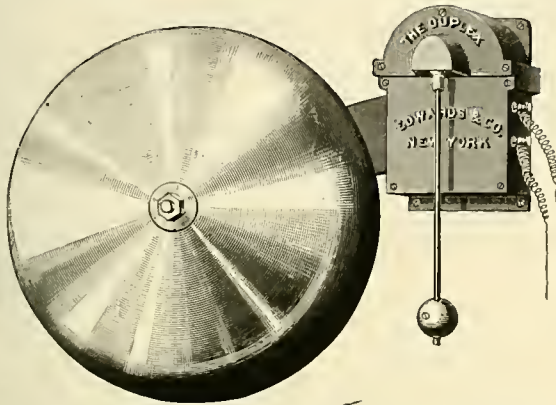
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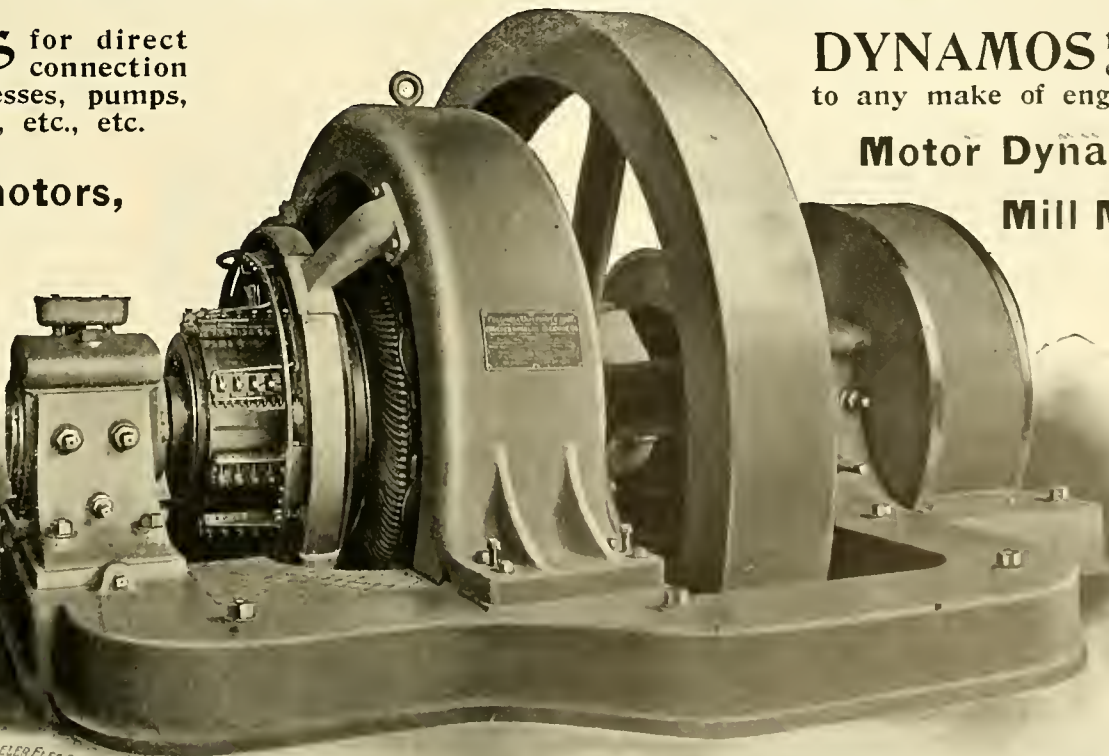
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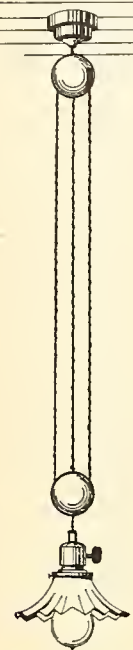
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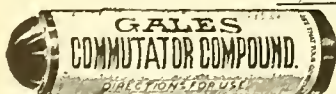
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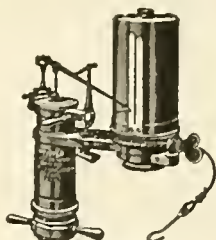
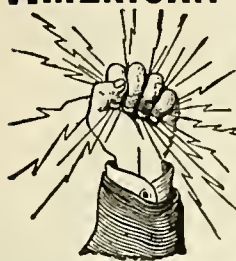
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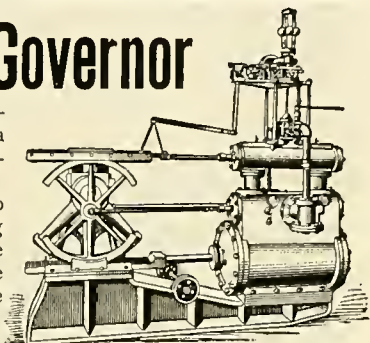
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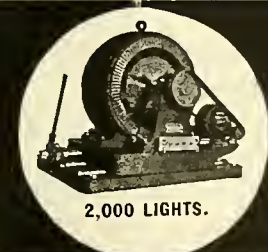
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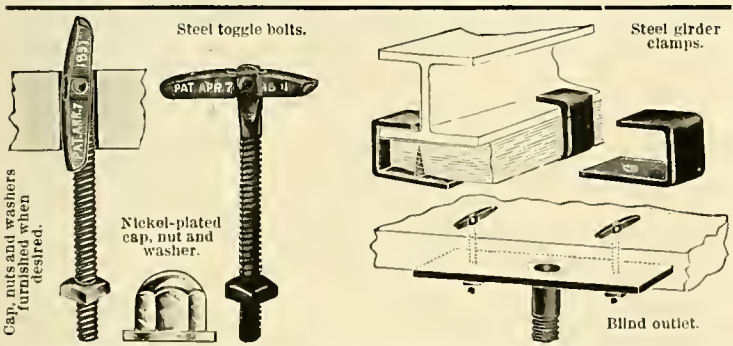
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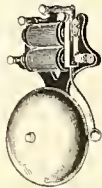
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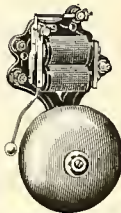
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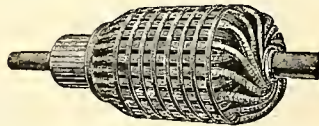
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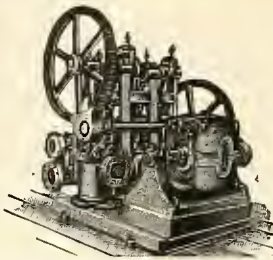
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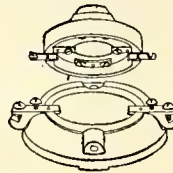
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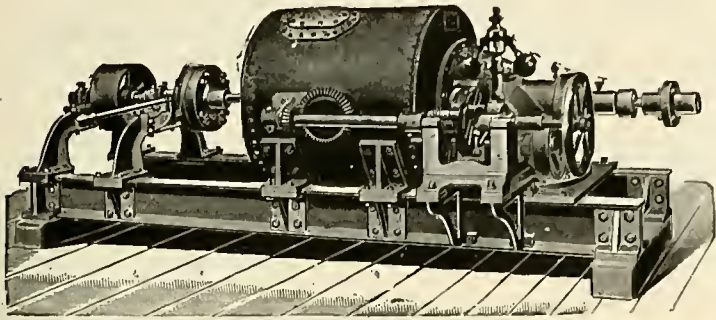
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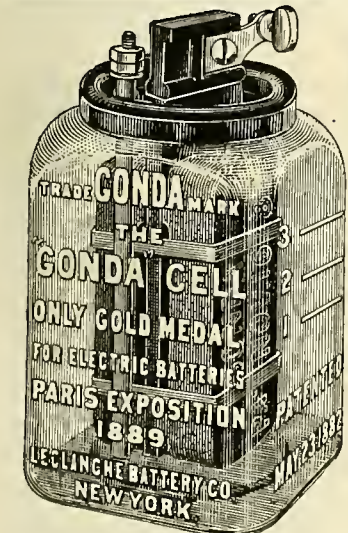
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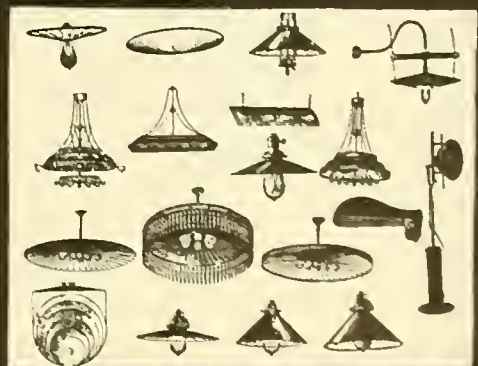
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One 1 h. p. T.-H.
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One 10 h. p. Eddy.
One 25 h. p. Brush.
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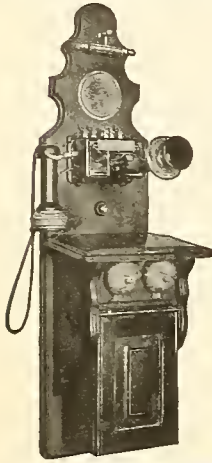
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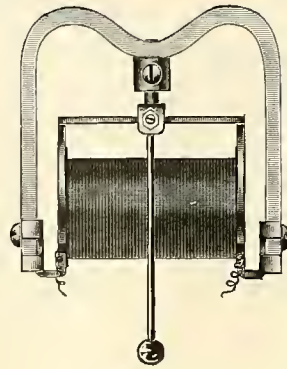
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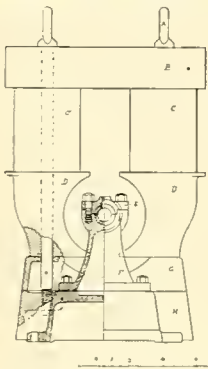
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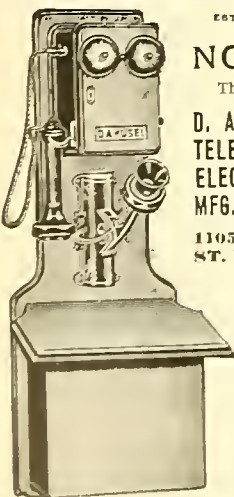
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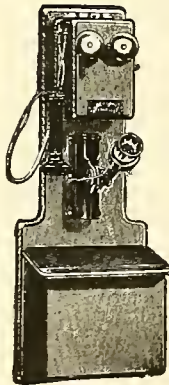
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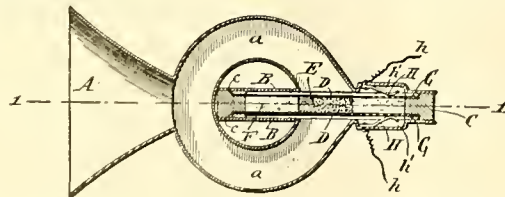
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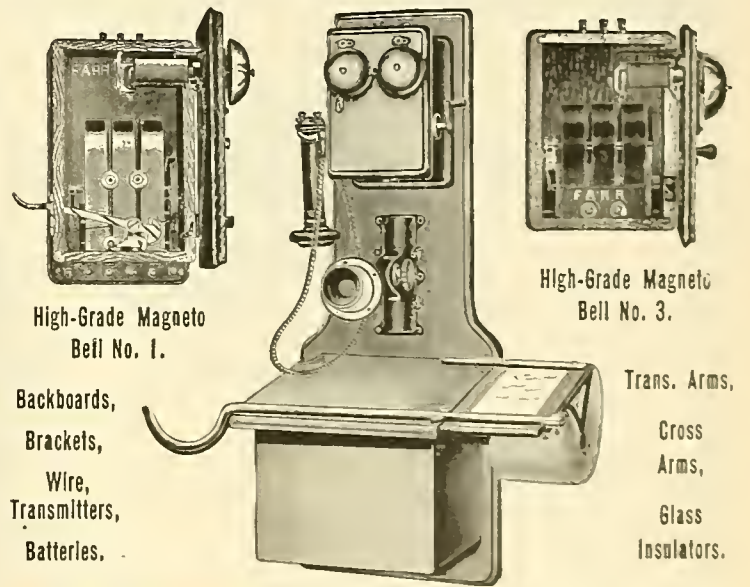
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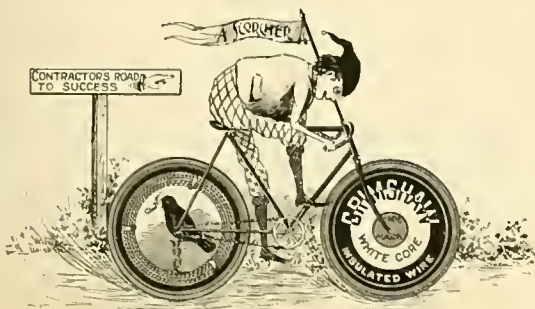
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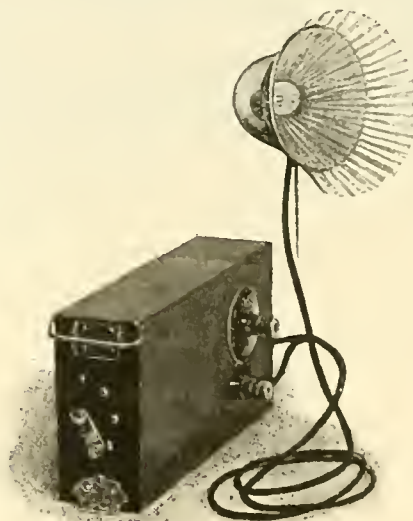
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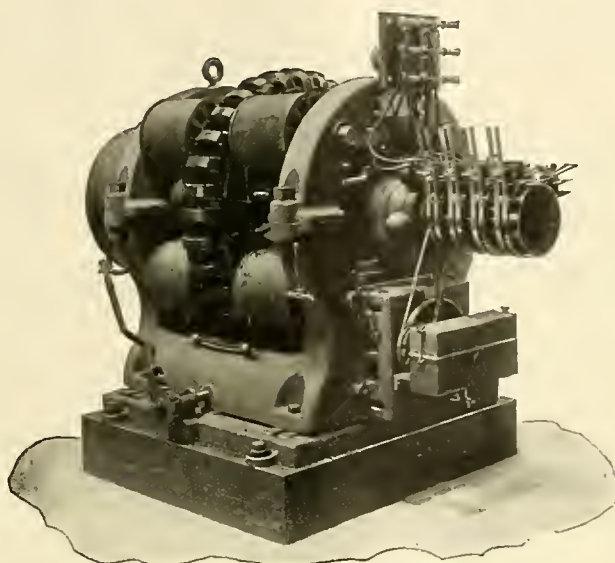
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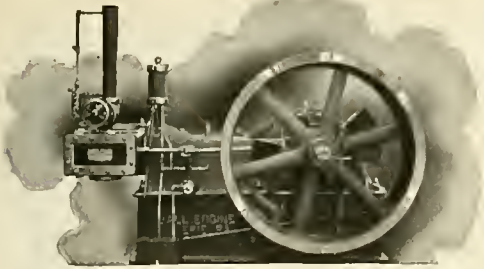
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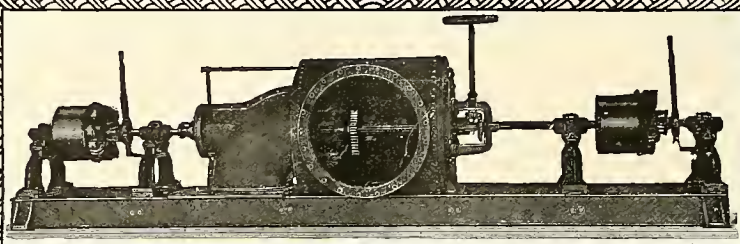
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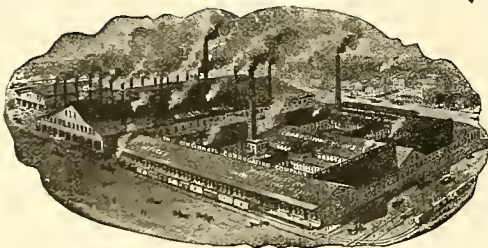
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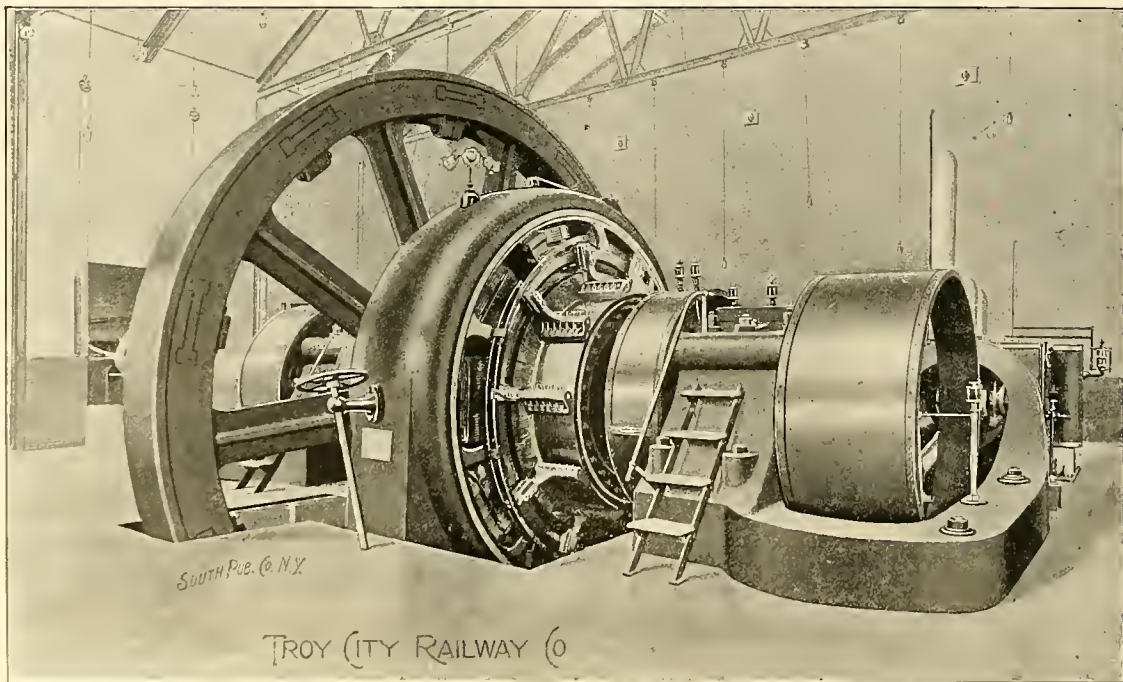
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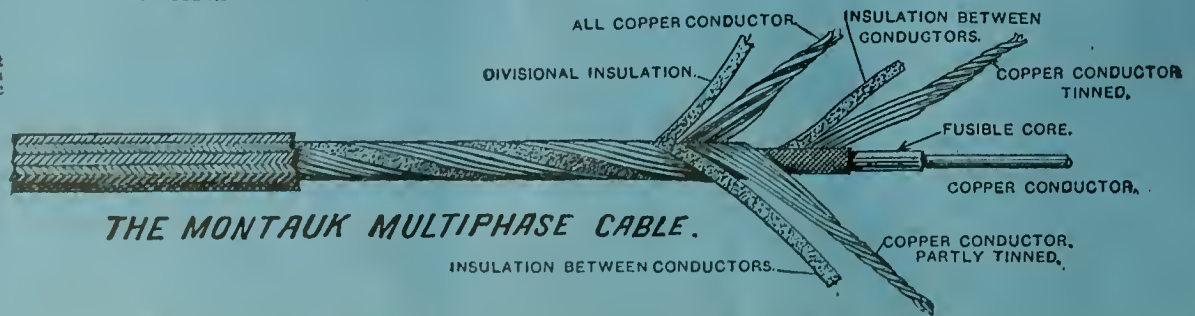
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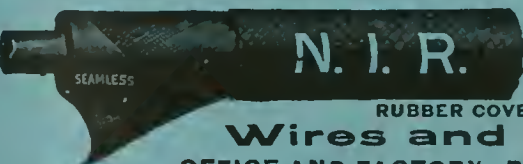
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 MANUFACTURERS OF NEW LAMPS.
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ALTERNATING OR DIRECT CURRENT.
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 Write for full particulars, etc.
 Two new styles of Baby

K **KNIFE-SWITCHES**
 Low Prices—that's wealth to you.
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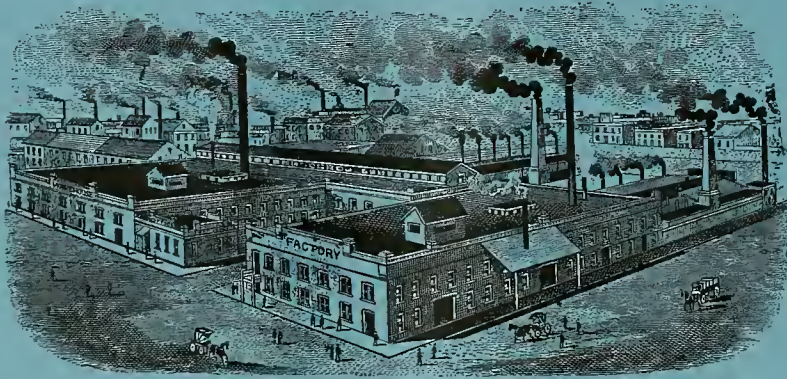
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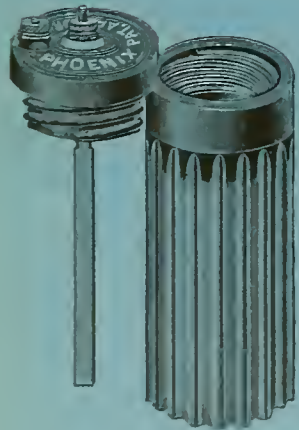
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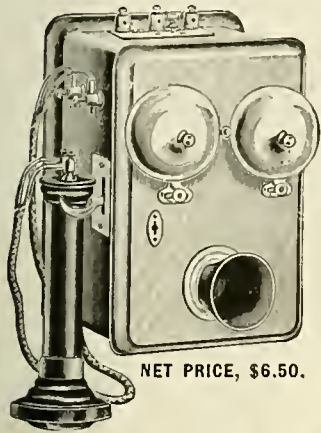
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THE MESCO DRY BATTERY (better than ever).

Prices to suit buyers who are using cheaper grades.

We are Manufacturers of Miniature Incandescent Lamps.



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For High Potential Power Transmission

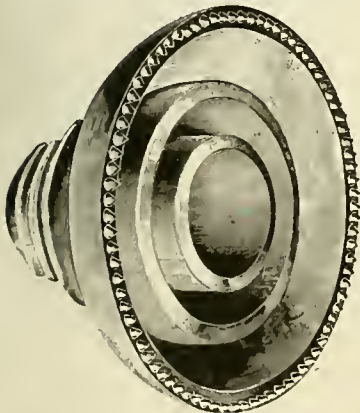
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This Insulator was designed by V. G. Converse, E. E., for the Telluride Power Transmission Company of Provo, Utah. It has been in successful operation for more than a year at Mercur, Colo., carrying a current of 40,000 volts. Manufactured and guaranteed by

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C. M. & St. P. R. R..... x.ii					
Chicago Rheostat Co.... x.ii					

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FOR DIRECT CURRENT ARC LAMPS.

WE HAVE IN STOCK THE FOLLOWING SIZES:

CORED CARBONS.

Diameter. Length.
 5-16 in. x 6 in., 6½ in., 7 in., 7½ in. and 8 in.
 3-8 in. x 7 in., 8 in., 9 in., 9½ in., 10 in. and 12 in.
 7-16 in. x 6 in., 7 in., 8 in., 9 in., 9½ in., 10 in. and 12 in.
 1-2 in. x 6 in., 7 in., 7½ in. and 8 in.
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SOLID CARBONS.

Diameter. Length.
 7-16 in. x 7 in. and 10 in.
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Having received a large consignment of these Carbons just before the new tariff went into effect, we are prepared to make very low prices. Send for price list.

CHICAGO EDISON COMPANY,

EDISON BUILDING, 139 ADAMS STREET, CHICAGO.

ABSOLUTE SAFETY

IS ASSURED ALL USERS OF

McINTYRE'S

Portable Electric Safety Lamp.



This is an Electric Lamp set in a White Enamelled Parabolic Reflector, and can be attached to the cap or any part of the clothing by means of a stick pin attached to reflector and connected to the battery with a flexible cord. The battery is arranged to be carried on a belt or in the pocket, so the user has free use of hands. The current can be turned off when not in use. Dry Batteries are used and can be recharged from direct incandescent electric current. Charger and full directions go with each lamp.

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For Watchmen, Miners, Mine and Gas Inspectors, Boiler Shops, Oil and Gas Works and Gas Filters, City Sewer and Underground Cable Inspectors; Powder Mills and Warehouses where explosive materials are manufactured and stored; exploring cellars and trenches where leaks occur, and investigating pipe connections where it is impossible to carry an oil lamp or candle for fear of explosion—and all parties requiring a safe, portable light. The whole outfit is neat and compact.

No. 1 Weighs 2 lbs., 1½ C. P. Price complete, \$ 4.00. For meter reading only.
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 " 3 " 12 " 10 " " " 12.00. For sev. persons to work by.

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 FOR 1899.

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 Discount on Large Orders.

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 510 Marquette Building, CHICAGO.

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ELECTRICAL ENGINEERS AND CONTRACTORS,

—And Manufacturers of—

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FOR SERIES, ALTERNATING AND DIRECT CURRENT.

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SEND FOR "SPECIALLY FINE" CATALOGUE.

AMONG OTHER THINGS WE GUARANTEE ARE:

That the material and workmanship in the vehicle shall be of the very best, including rubber tires and ball bearing axles.

That for a period of one year the Company will replace, free of charge, any broken parts due to defective material or faulty shop construction.

That the vehicle shall have, on a level hard roadway, a mileage capacity in one charge of the batteries that will carry its given load twenty-five miles at an average speed of twelve and one-half miles per hour, two hours.

That the batteries can be charged when fully discharged in two and one-half hours' time.

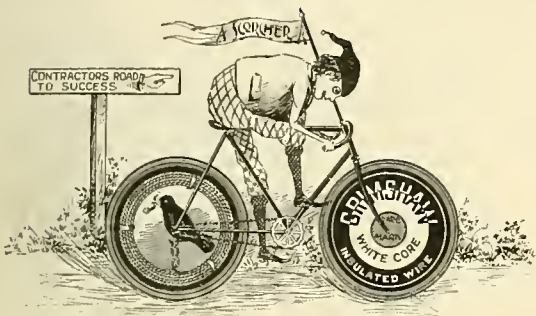
That the vehicle shall be capable of climbing a six per cent. grade with given load when batteries are reasonably well charged.

That for the sum of \$50.00 per annum, the Company will furnish all parts for keeping batteries in perfect repairs for a period of five (5) years, leaving them at the end of the five years in good condition for operation during the ensuing year.

AVERAGE COST TO RUN PER MILE, 3-4 CENT.

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MOTORS for direct connection to printing presses, pumps, air compressors, etc., etc.

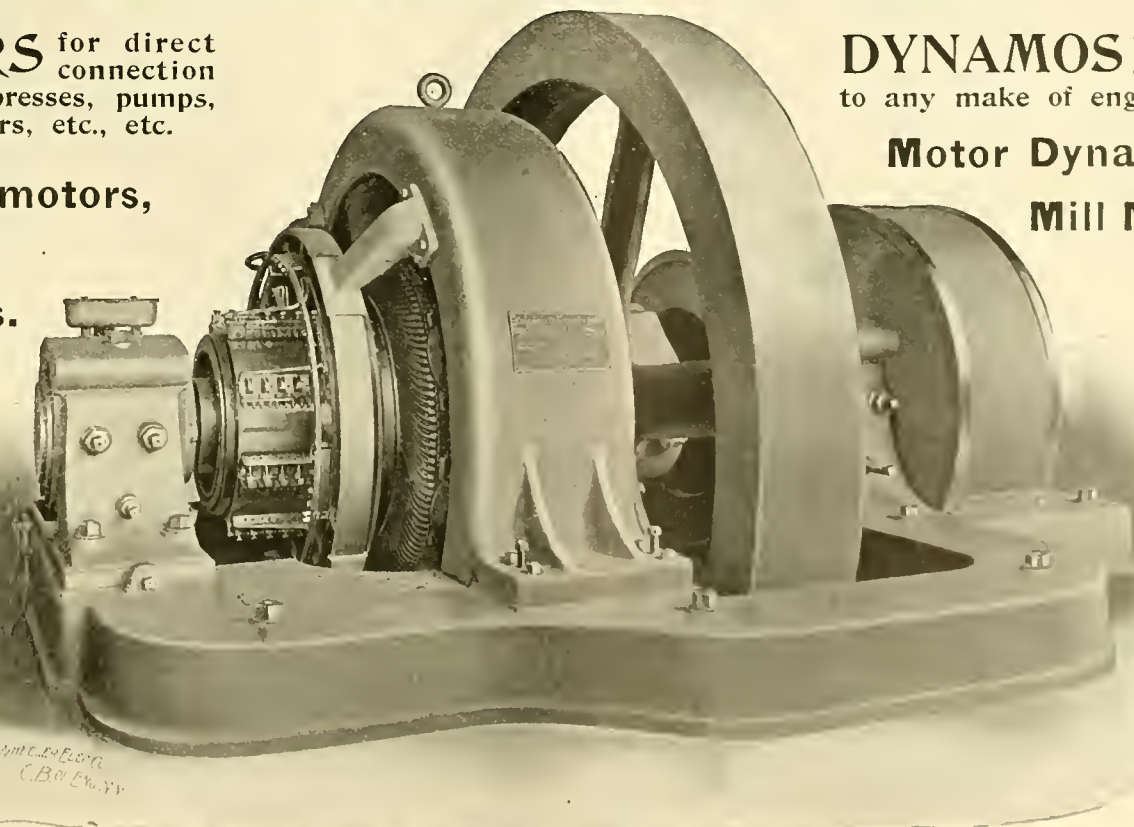
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DYNAMOS for direct connection to any make of engine.

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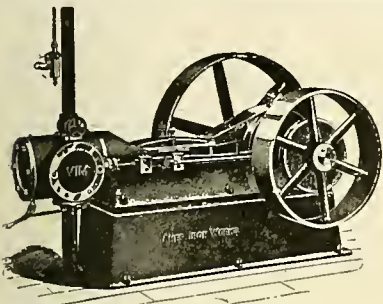
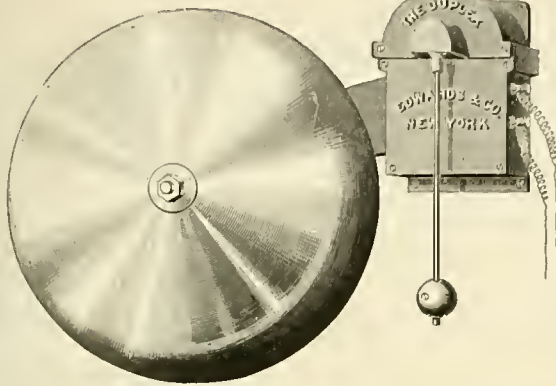
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SINGLE STROKE or VIBRATING

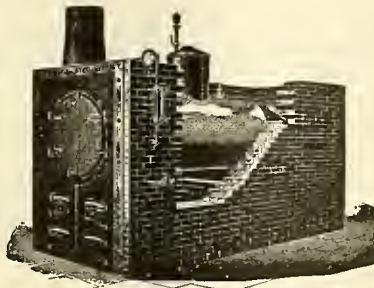
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RAILROAD CROSSINGS, MINES, CAR STARTERS,
SCHOOLS, FACTORIES, FIRE ALARMS, ETC.

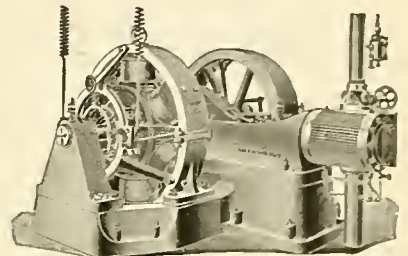
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Boilers of All Kinds.



Ames High Grade Automatic.

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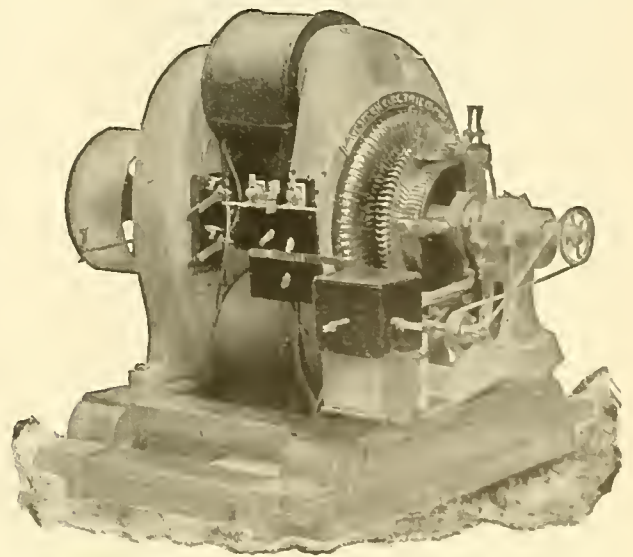
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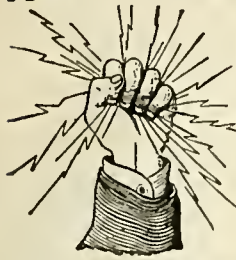
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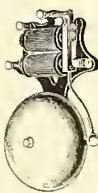


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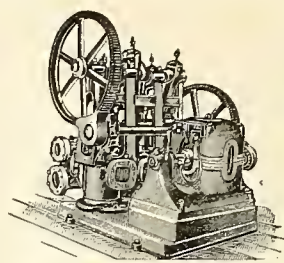
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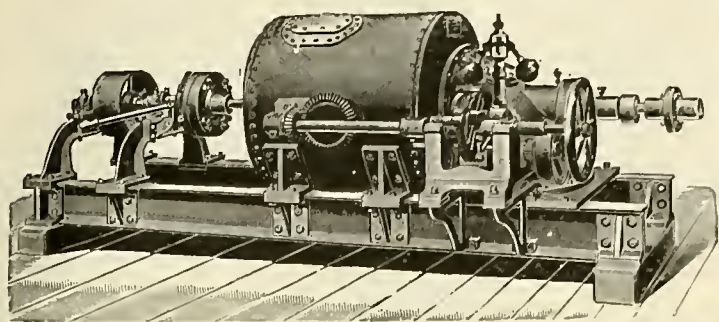
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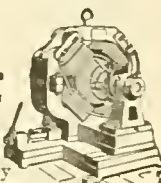
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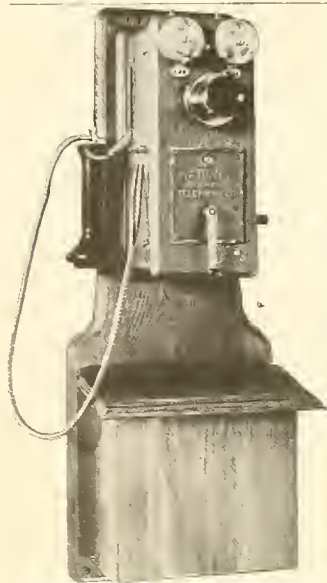
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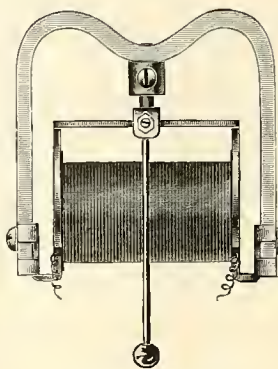
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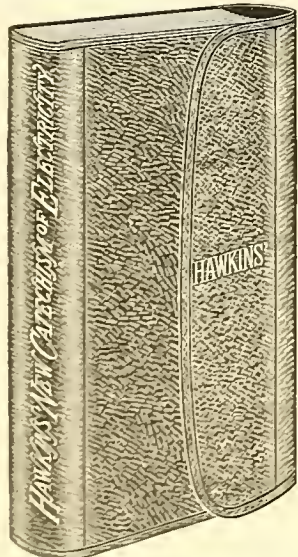
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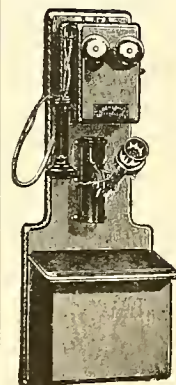
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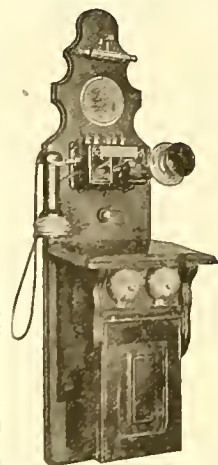
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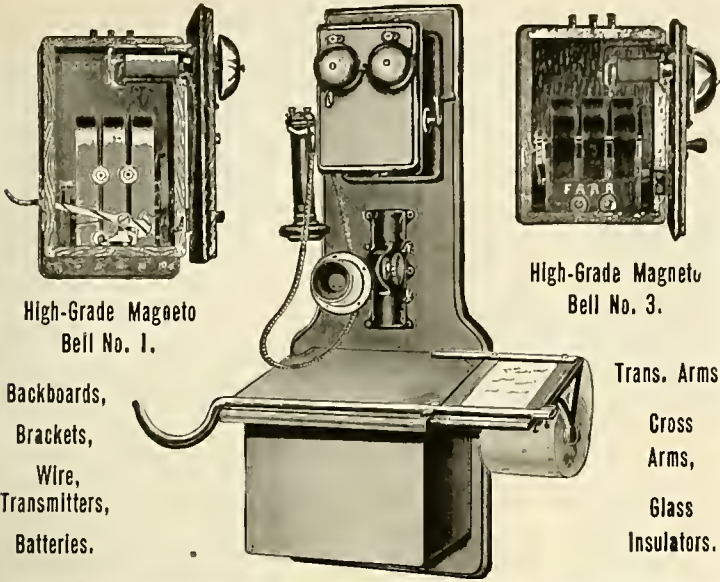
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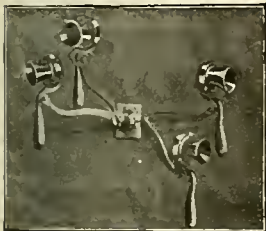
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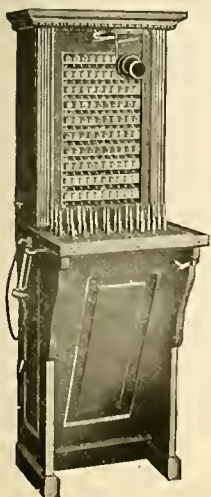
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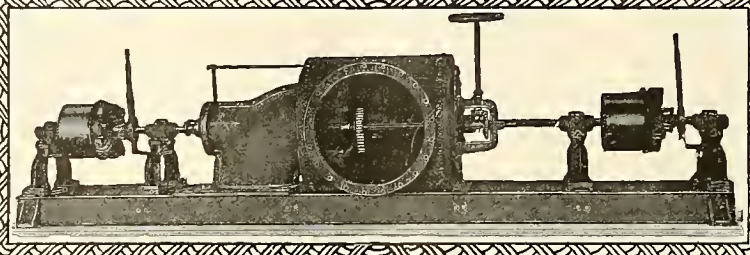
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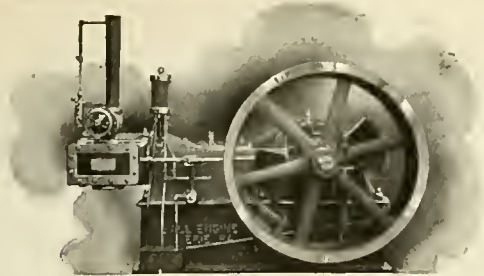
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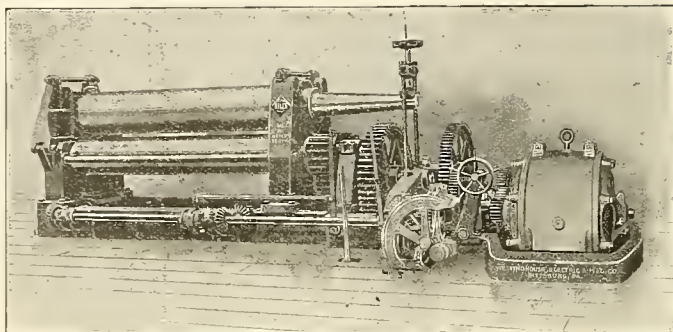
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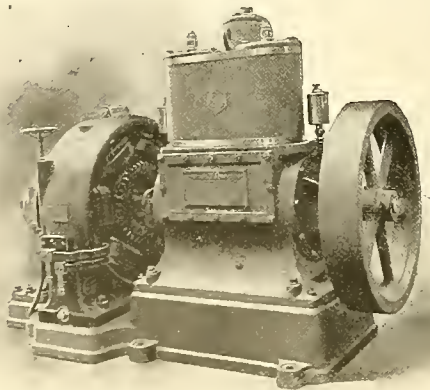
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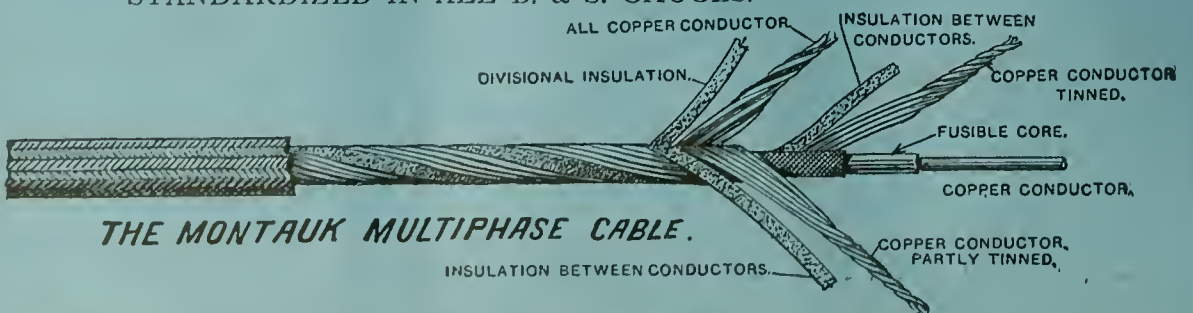
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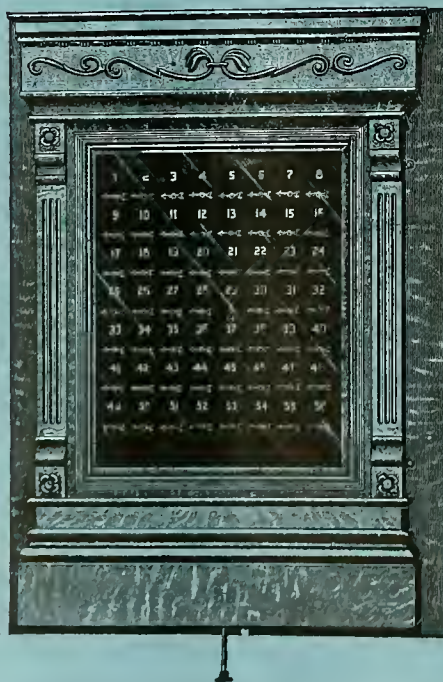
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REGISTERED SEPTEMBER 11, 1894

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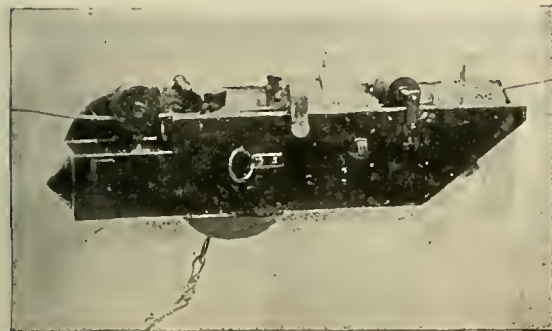
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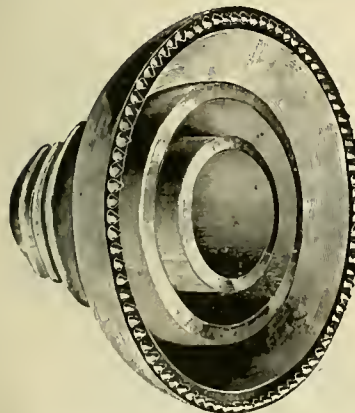
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Table with multiple columns listing various companies and their advertisement page numbers, including Allen-Hussy Co., American Battery Co., American El. Heater Co., etc.

For Classified Index of Advertisements See Page VI.

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FOR DIRECT CURRENT ARC LAMPS.

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Diameter. Length.
 5-16 in. x 6 in., 6½ in., 7 in., 7½ in. and 8 in.
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Diameter. Length.
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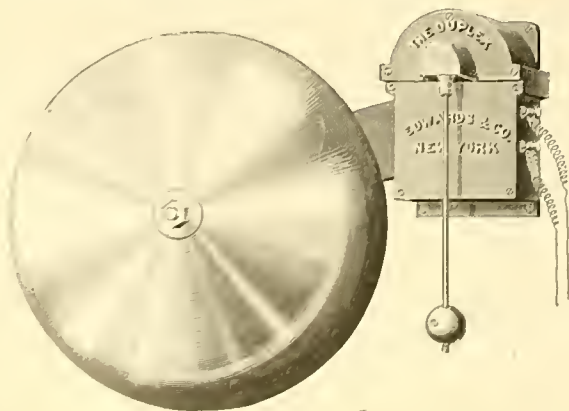
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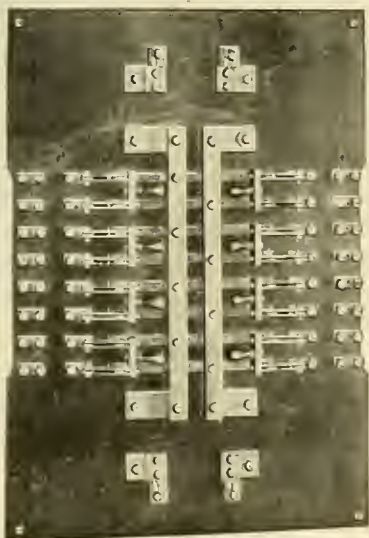
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"Our belts are as soft as calfskin."

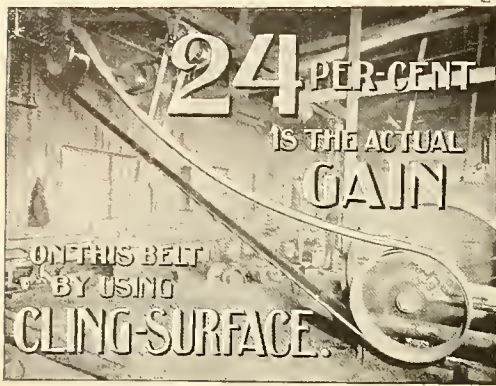
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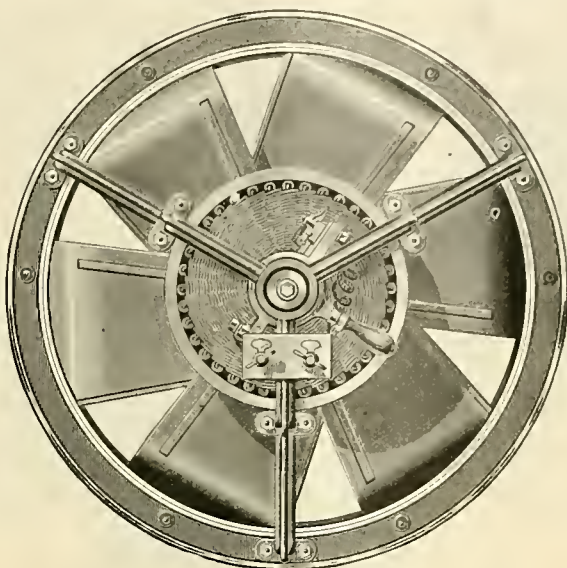
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- Cables, Electric (See Insulated Wires).**
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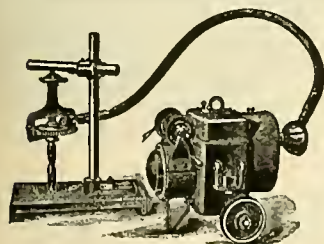
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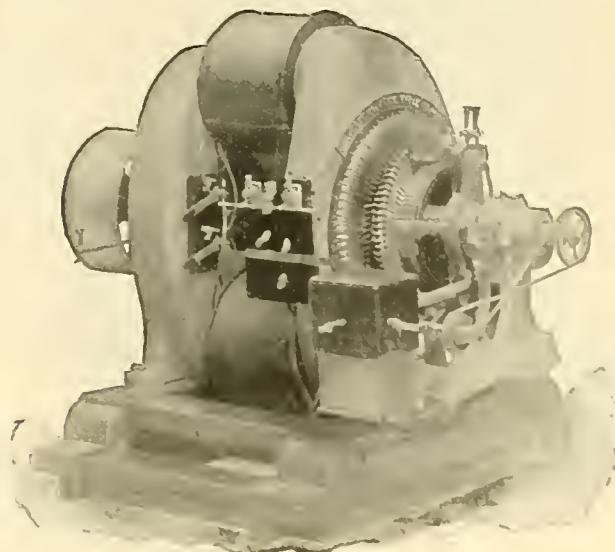
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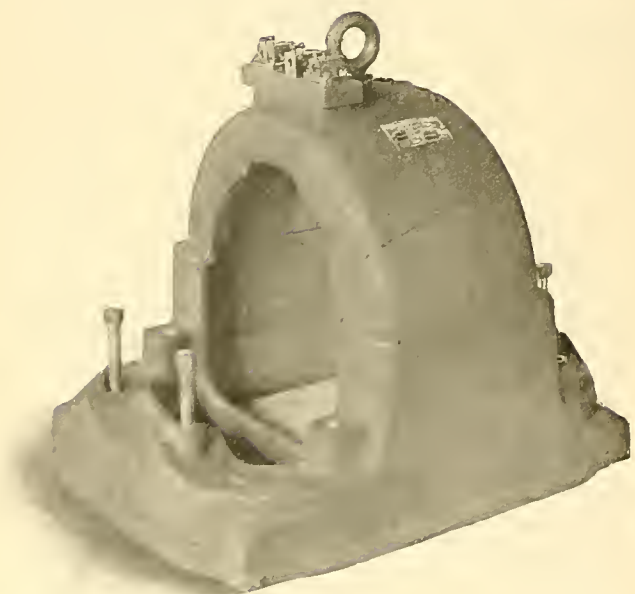
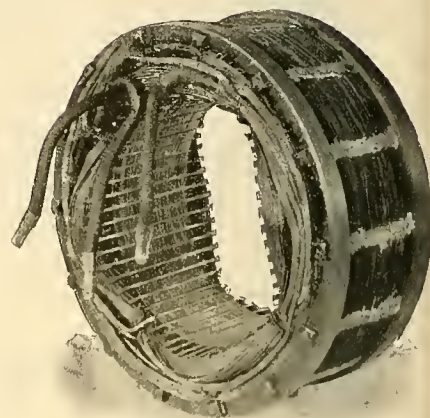
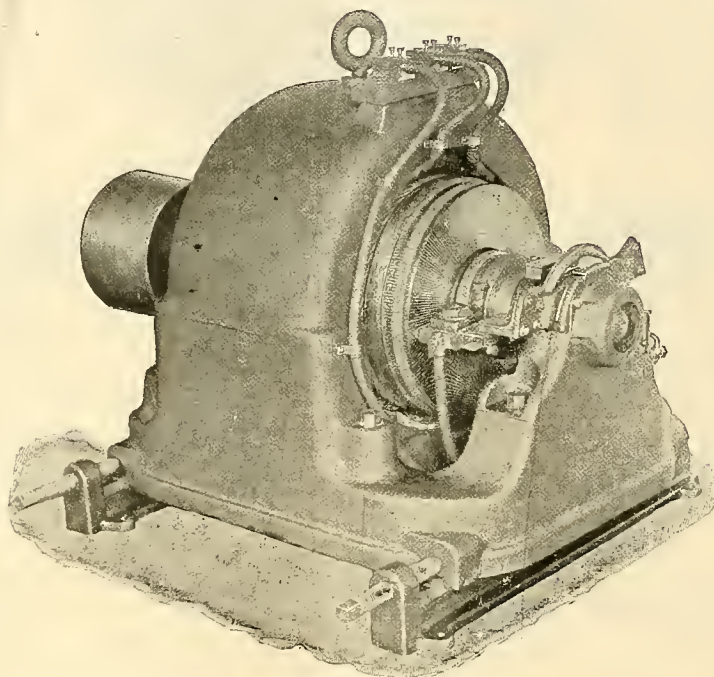
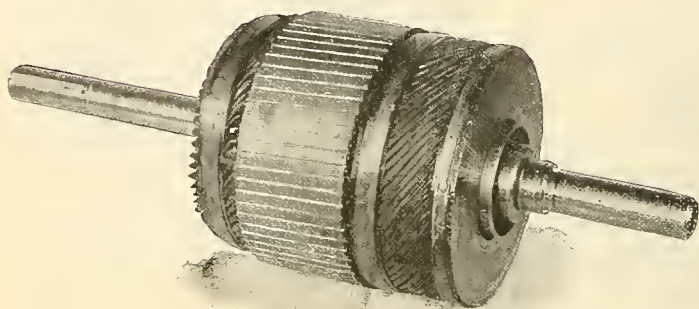
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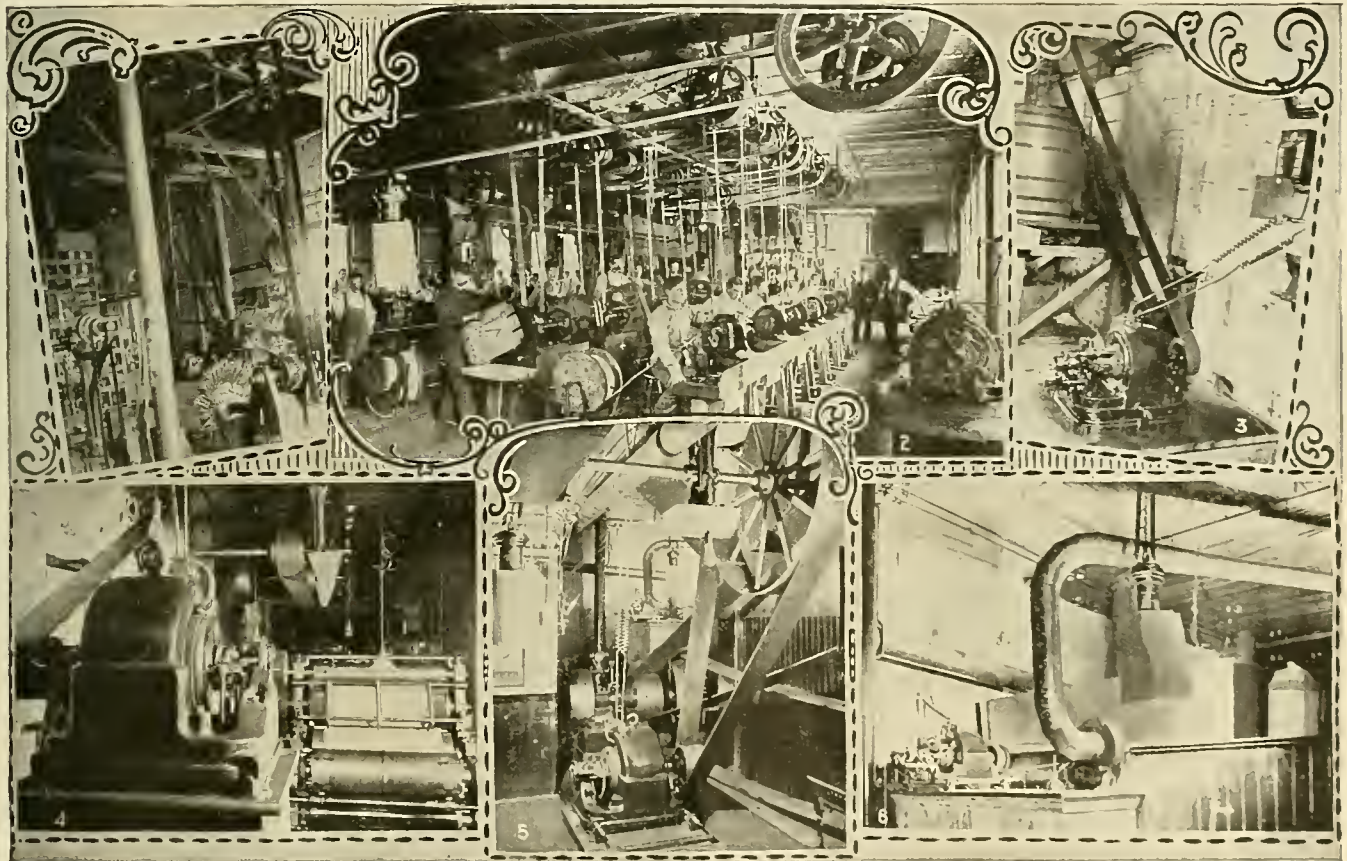
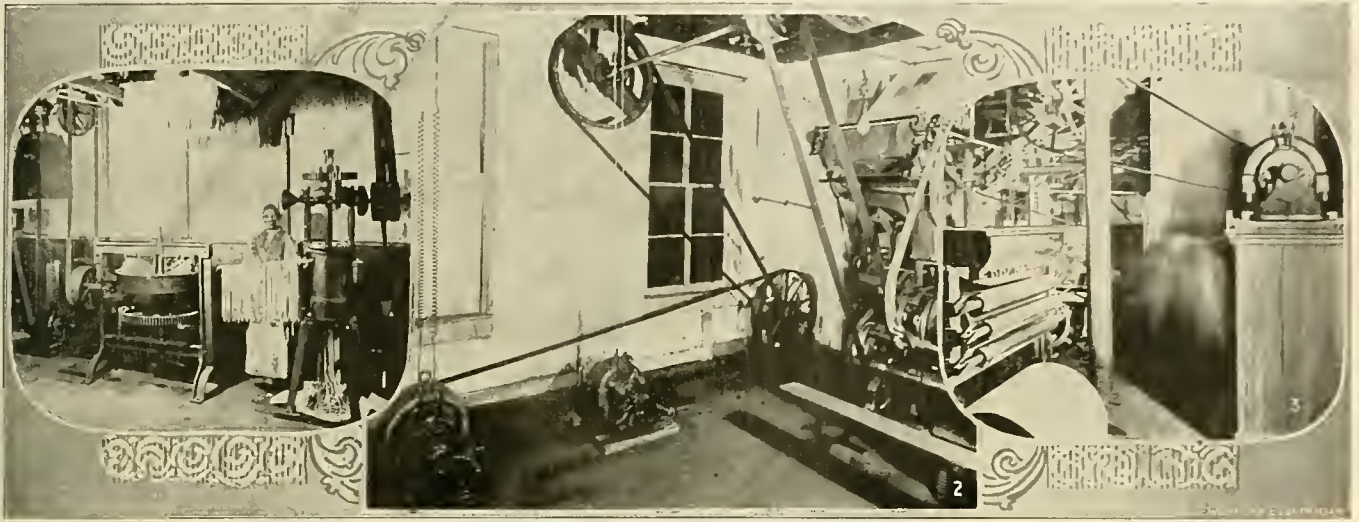
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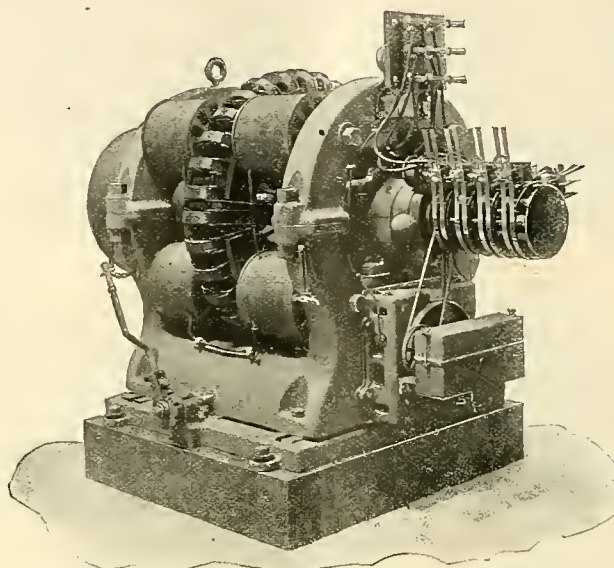
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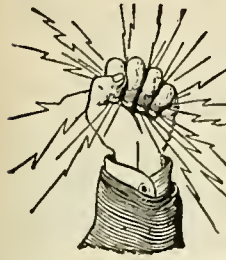
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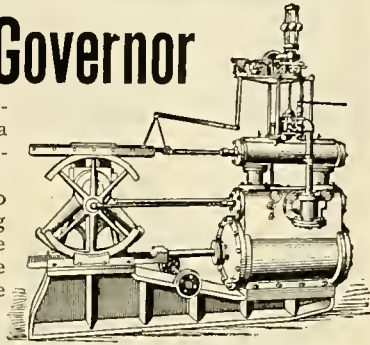
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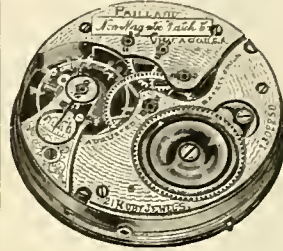
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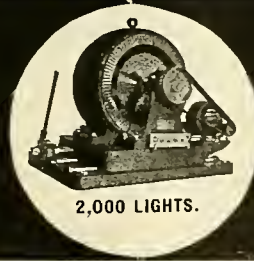
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Two Electric Lighting Companies in the City of Beloit, Wis., having been consolidated and converted into a Water Power Plant, the following list of machinery has been thrown out of use and is for sale. None of it is over four years old, some of it used but little, and the best of it, such as the engines, are as good as new.

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1 60 h. p. horizontal engine, 8x14 in. cylinder, Manufactured by the John T. Noye Mfg. Co., Buffalo.

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1 160 h. p. Corliss Engine, 14x32 in. Manufactured by Hoffman & Billings Mfg. Co.

1 Brownell full front boiler, 53 in. x 14 ft., pattern No. 70.

1 Root full front boiler, 70 h. p.
1 Excelsior Iron Works boiler, 5 ft. 3 in. x 12 ft., full front.

1 Taplin, Rice & Co. boiler, 5 ft. 6 in. x 15 ft., full front.

Pumps, injectors, governors, shafting, floor stand, pulleys, belt tighteners, belting, etc.

Apply to the

BELOIT ELECTRIC CO.,
Beloit, Wisconsin.

TO CONTRACTORS.

Chicago, January 12th, 1899.

Notice is hereby given that the Board of Local Improvements of the Board of West Chicago Park Commissioners will receive sealed bids for 33 electric-light lamps for South Oakley Avenue, between the south line of Washington Boulevard and the northerly line of West Twelfth Street and Ogden Avenue, until the hour of 4 o'clock in the afternoon of the 24th day of January, A. D. 1899.

Such bids will be received at that time for:

33 Electric-Light Lamps, put in place and ready for lighting purposes.

To be done according to the plans and specifications for said improvement to be found and on file in the office of the Engineer of the West Chicago Park Commissioners, in Union Park, Chicago, Illinois.

The contractor for said work and for every part thereof will be paid in bonds, which bonds will be paid out of the special assessment, to be collected in five annual installments, levied for the purpose of paying the cost of the improvement of said South Oakley Avenue, and said bonds will bear interest at the rate of 6 per centum per annum, payable annually.

All proposals or bids shall be delivered to the President of the Board of Local Improvements of the West Chicago Park Commissioners on or before the hour of 4 o'clock in the afternoon of said 24th day of January, A. D. 1899.

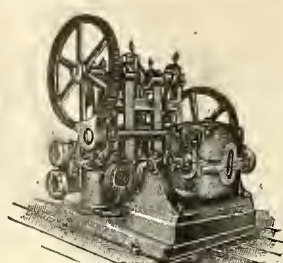
All proposals or bids shall be accompanied by a check, certified by a responsible bank, payable to the order of the "President of the Board of Local Improvements of the West Chicago Park Commissioners," for an amount which shall not be less than 10 per cent. of the aggregate of the proposal.

No proposal or bid will be considered unless the same is accompanied by a certified check for not less than 10 per cent. of the total amount of the proposal or bid.

The Board of Local Improvements reserves the right to reject any and all bids.

ANTON PETERSEN,

President Board of Local Improvements of the West Chicago Park Commissioners.
Attest: **ERNEST G. SCHUBERT,**
Secretary.



Selling Agents: Risdon Iron Works, San Francisco, Cal.; C. B. Boothe & Co., Los Angeles, Cal.

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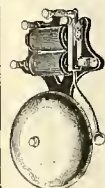
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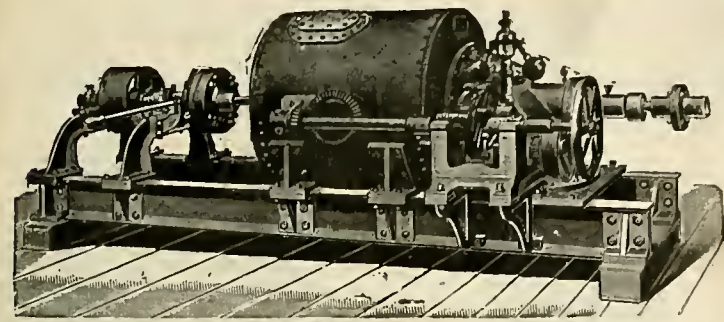
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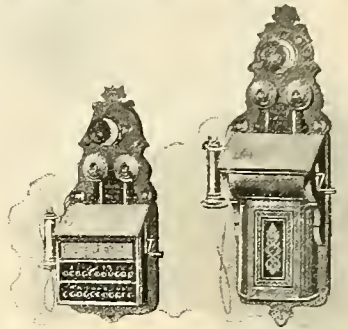
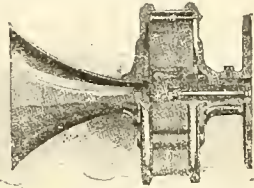
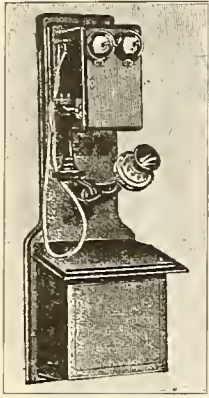
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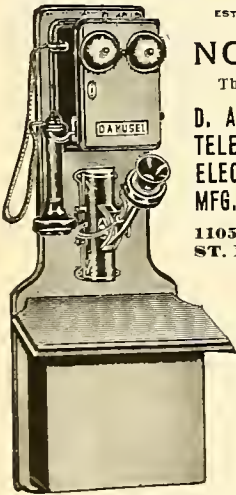
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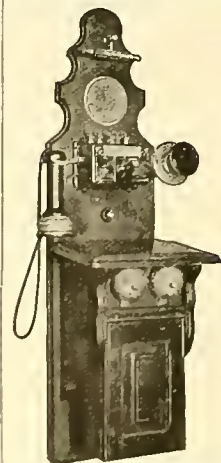
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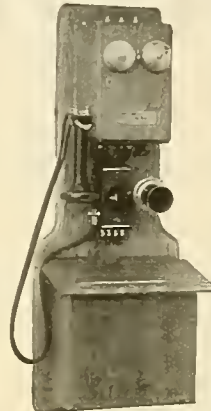
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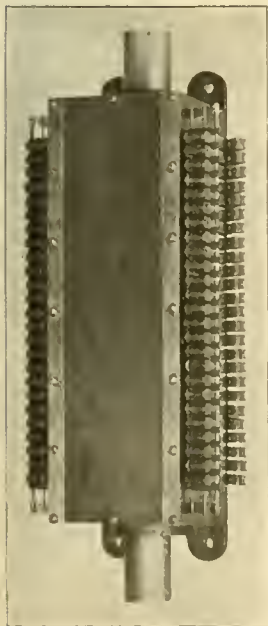
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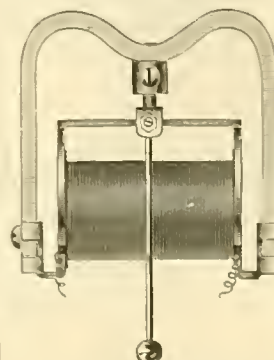
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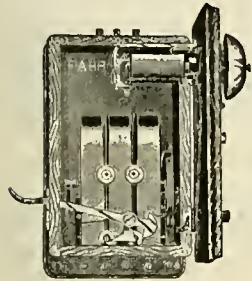
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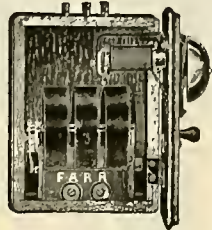
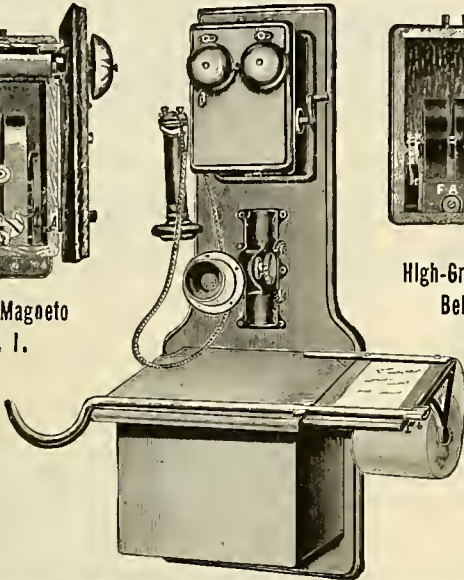
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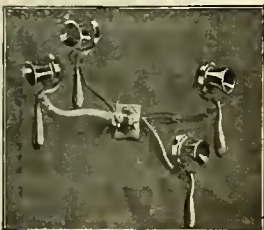
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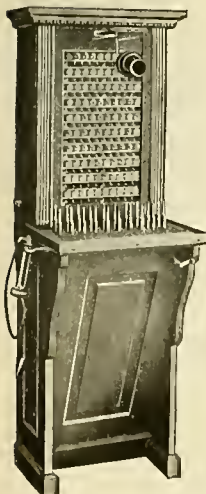
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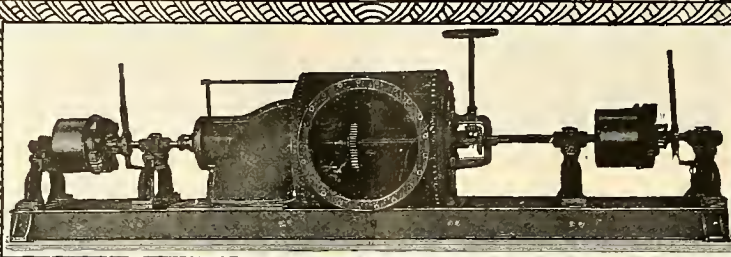
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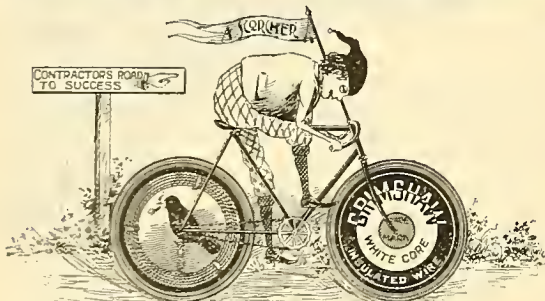
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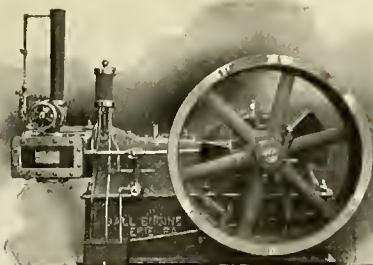
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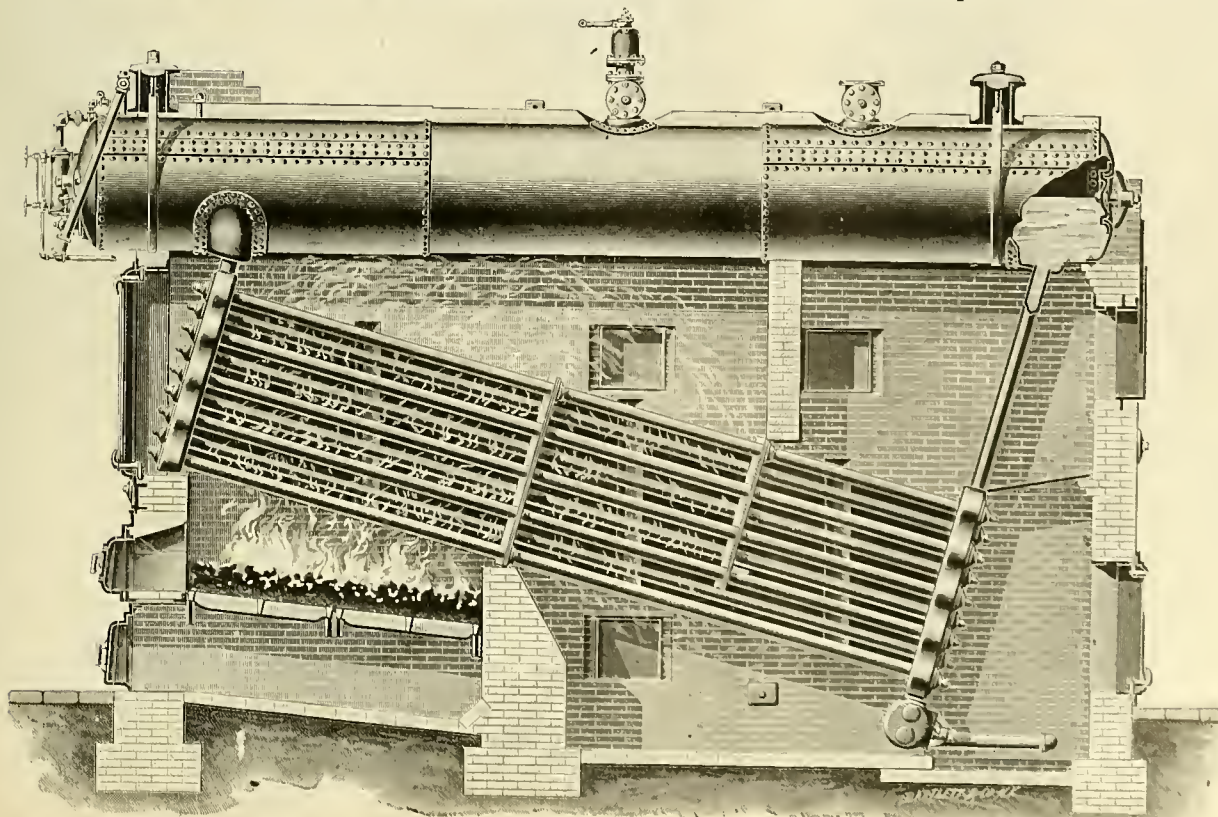
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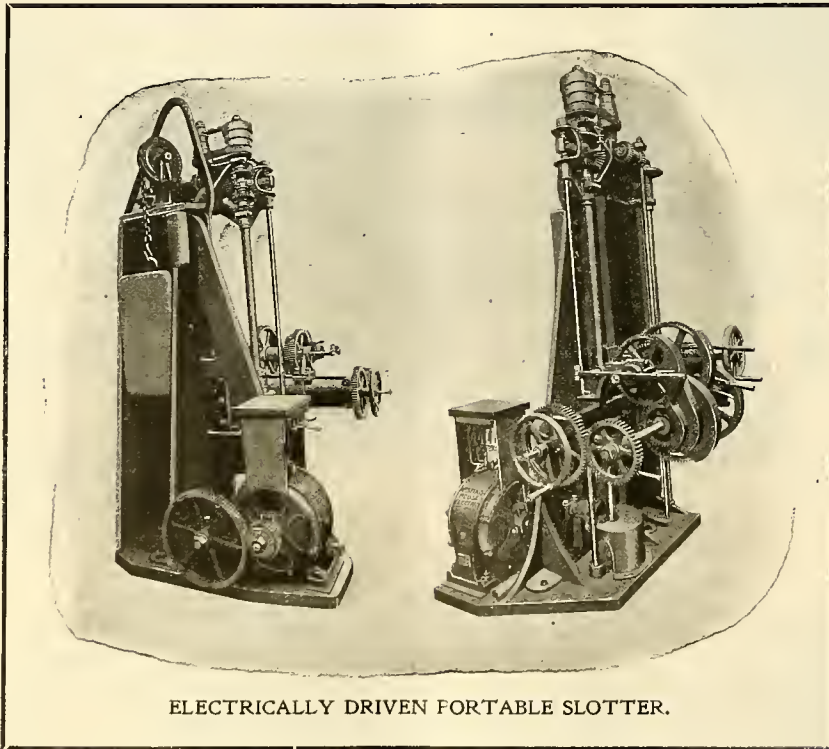
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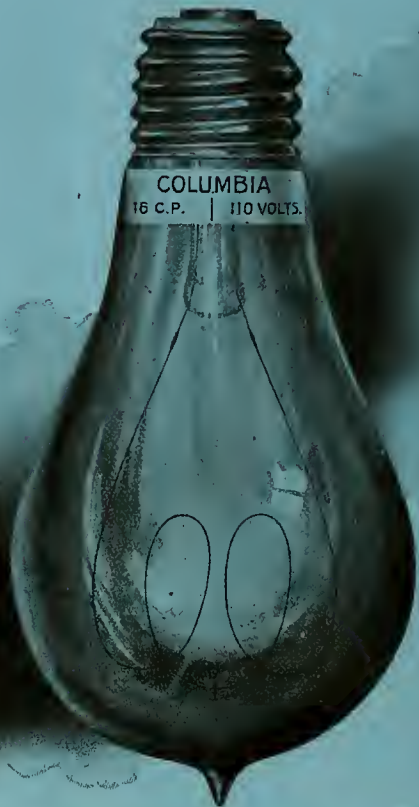
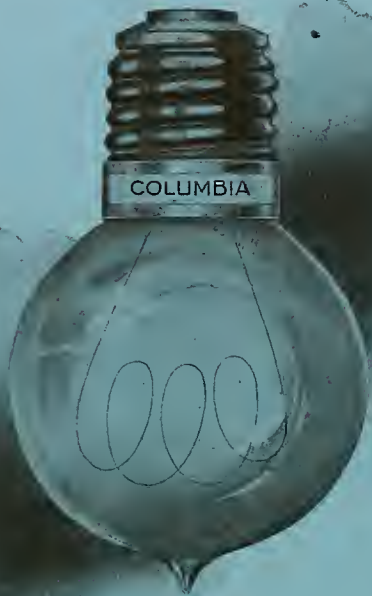
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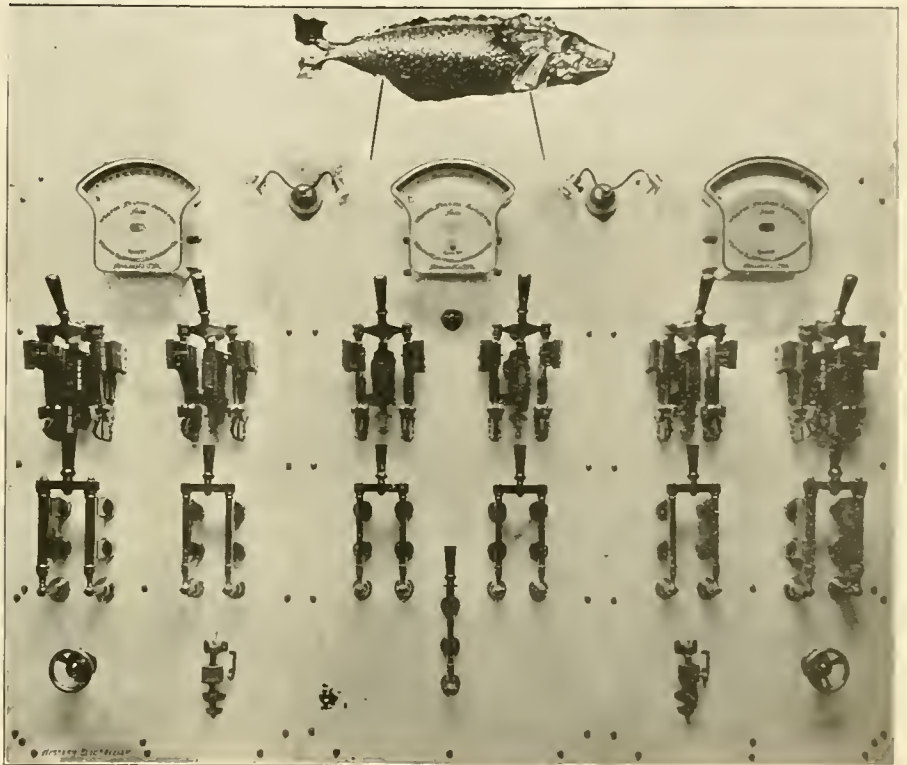
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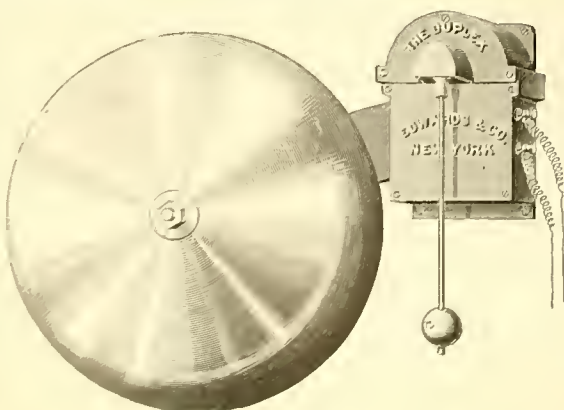
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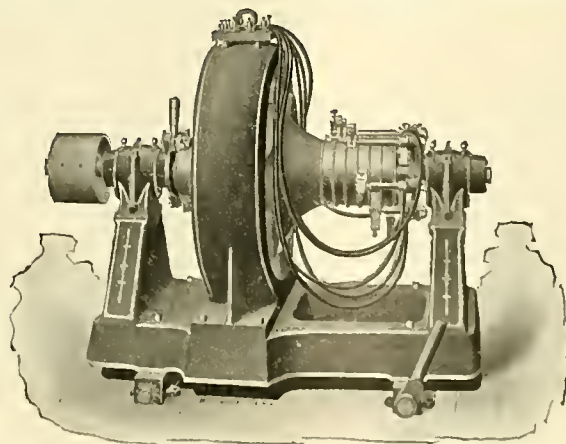
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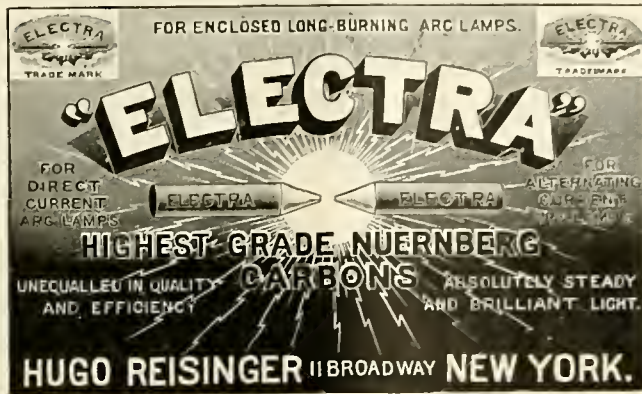
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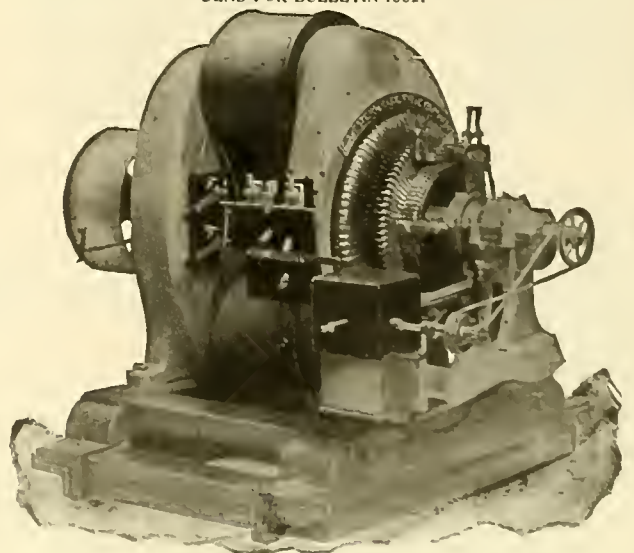
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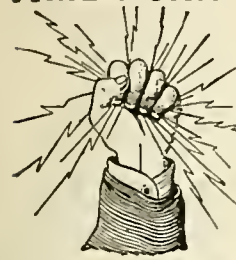
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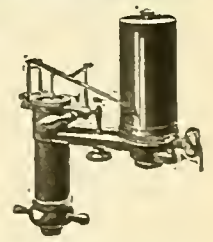
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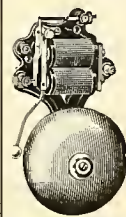
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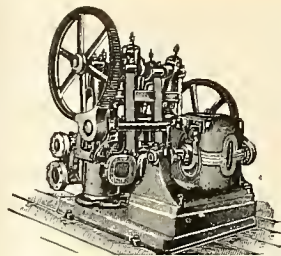
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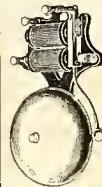
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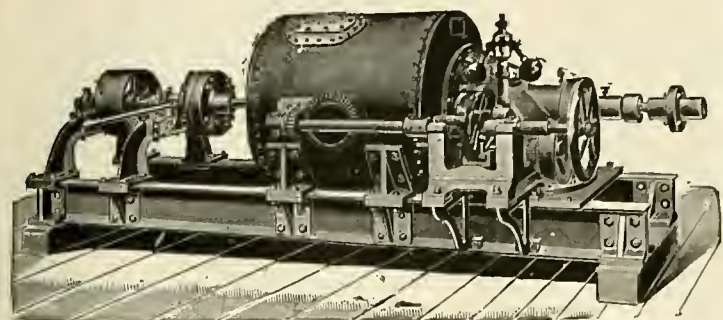
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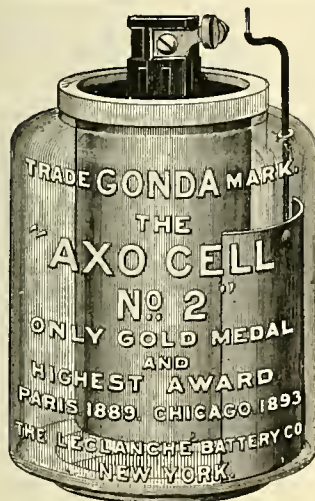
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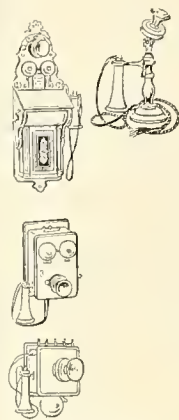
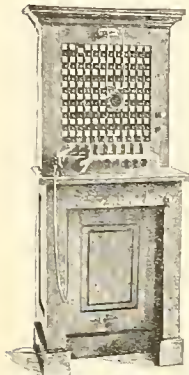
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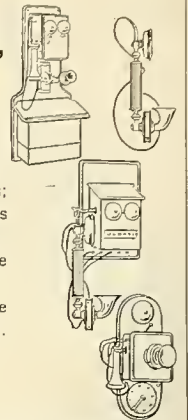
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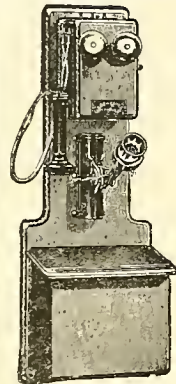
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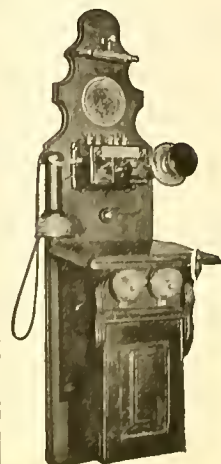
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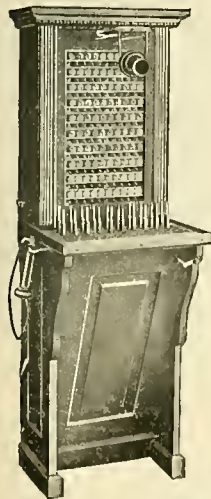
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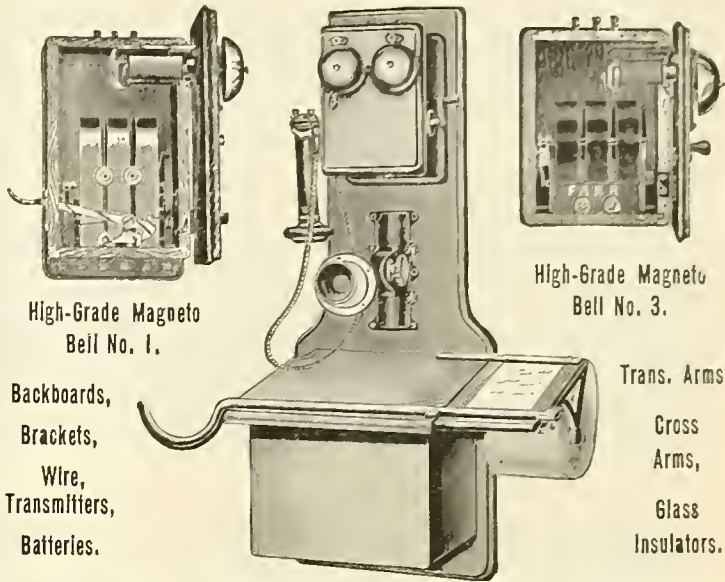
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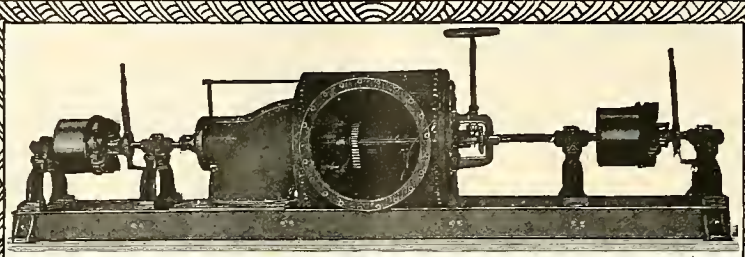
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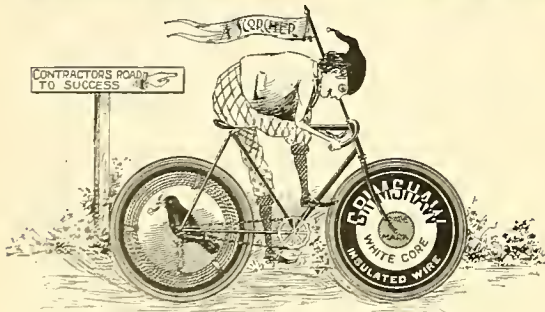
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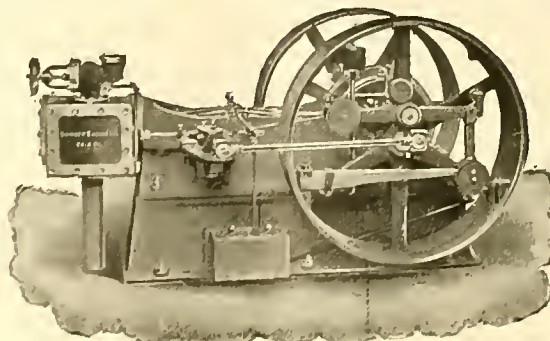
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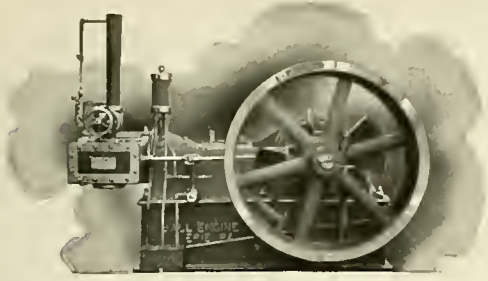
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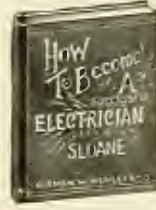
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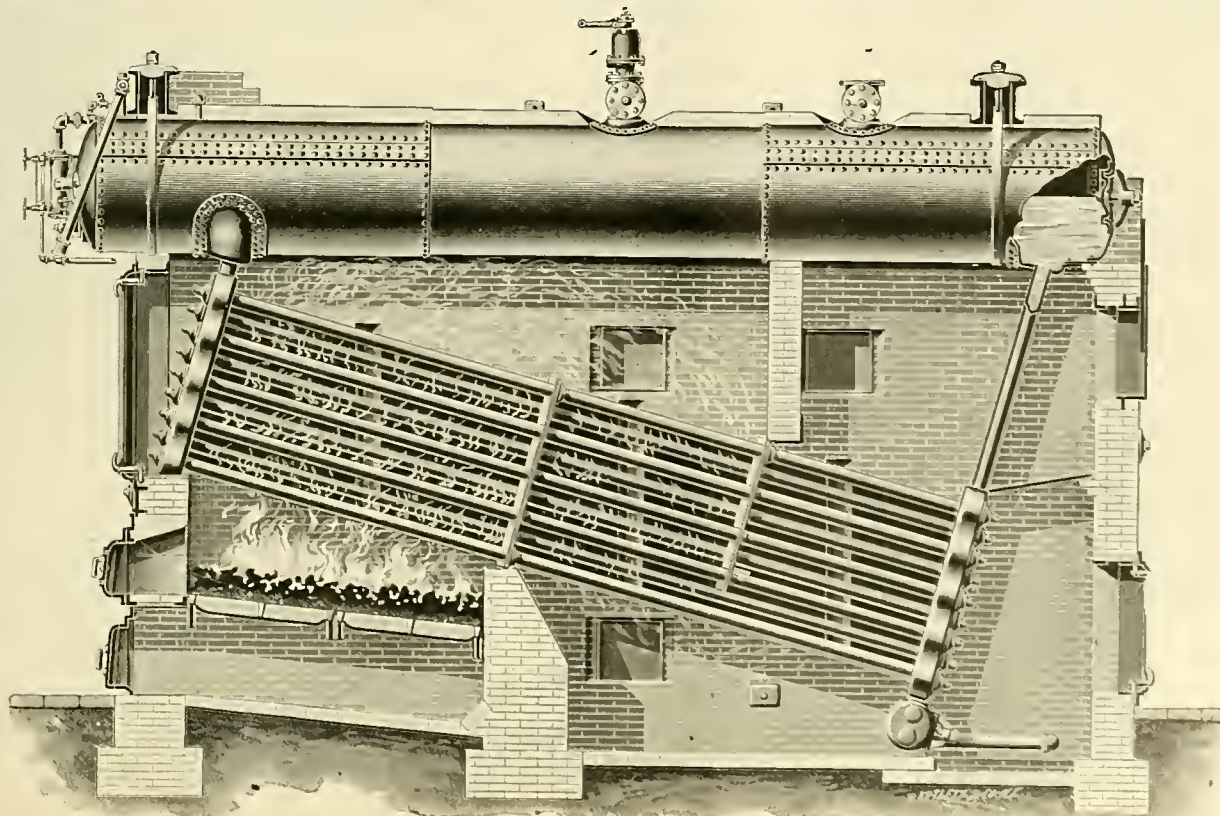
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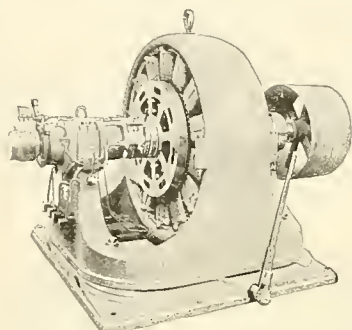
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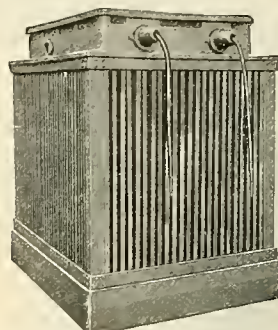
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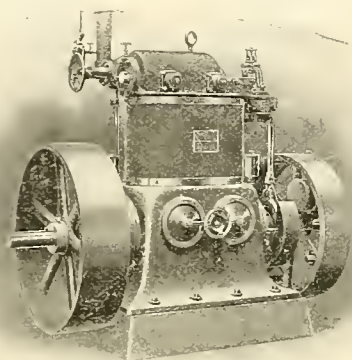
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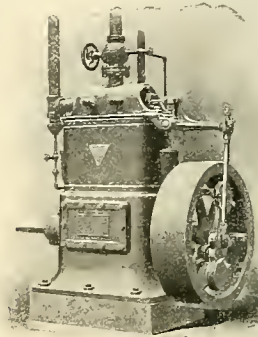
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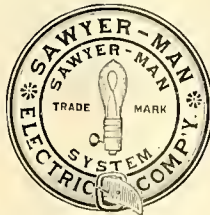
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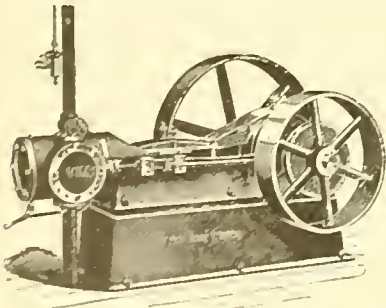
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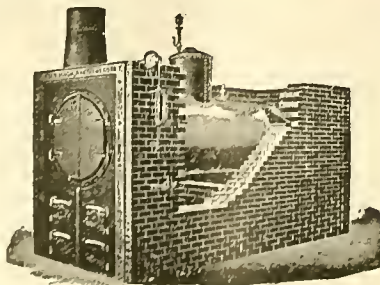
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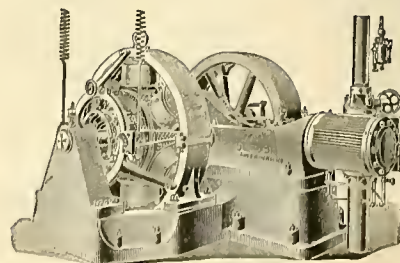
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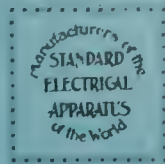
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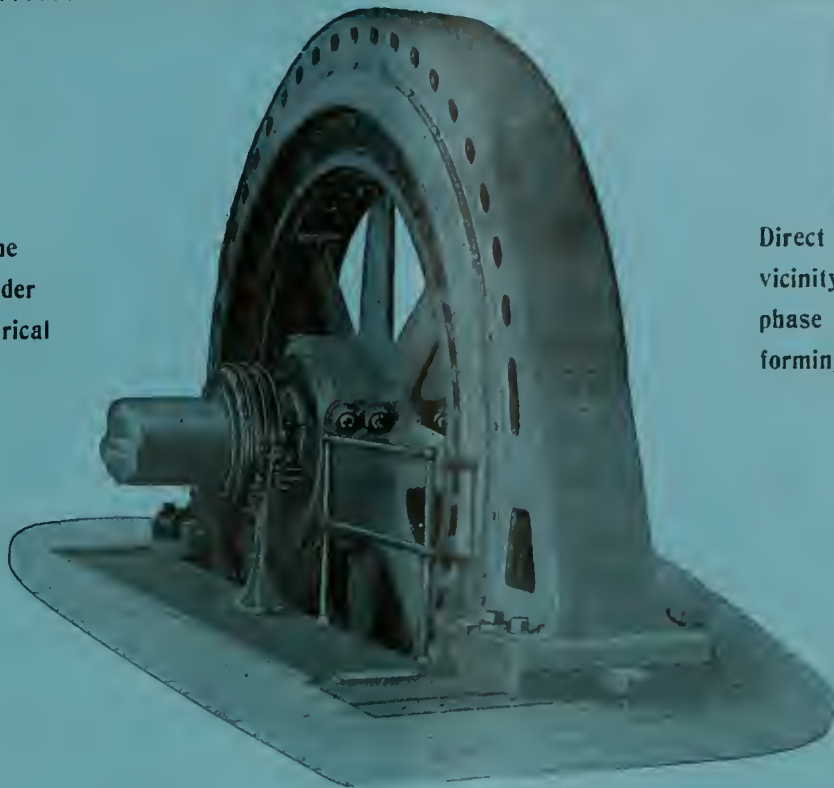
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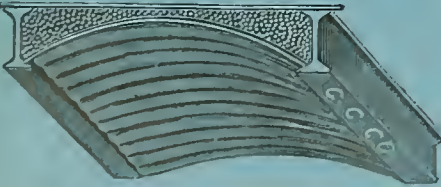
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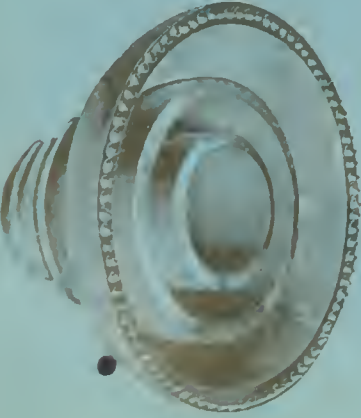
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 Vol. XXIV. CHICAGO, FEBRUARY 4, 1899. No. 5

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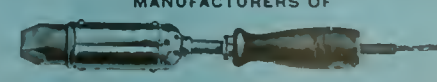
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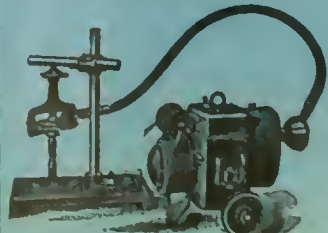
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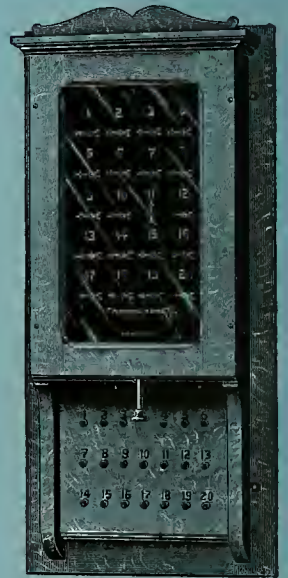
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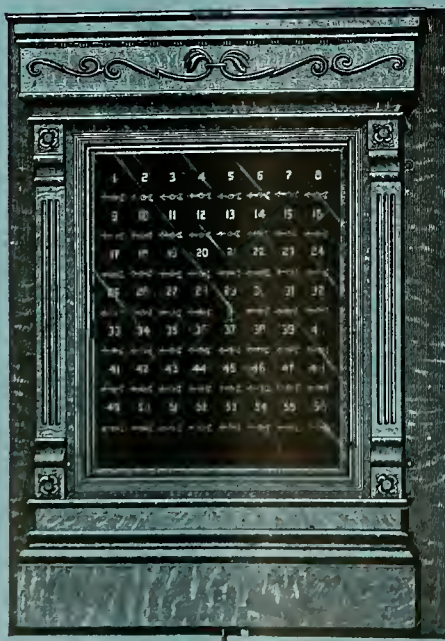
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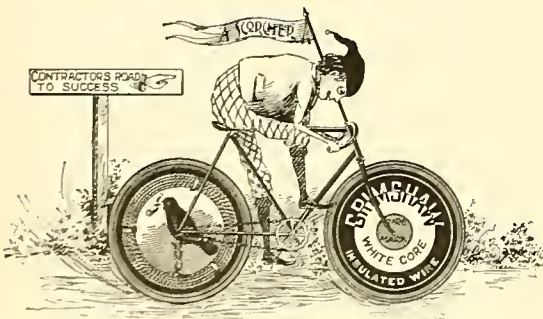
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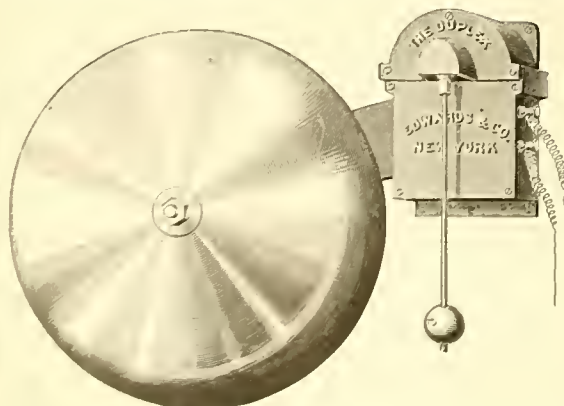
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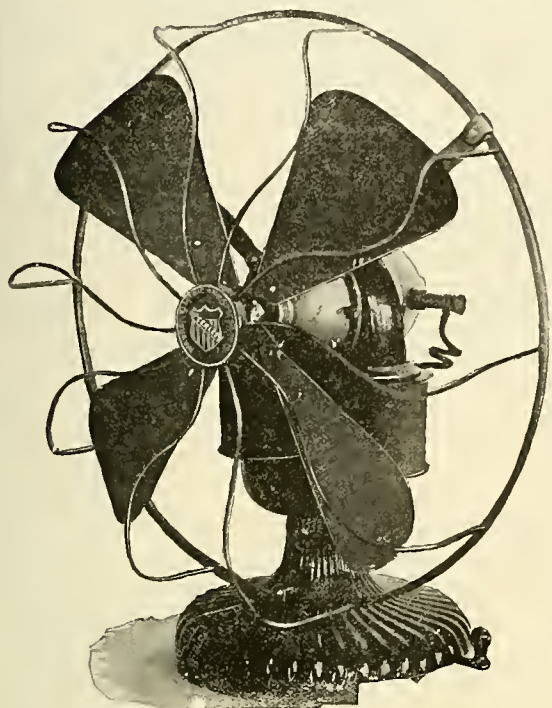
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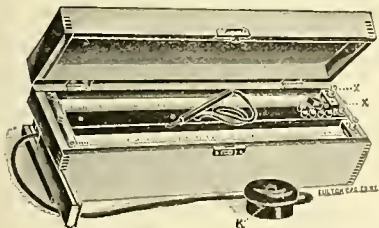


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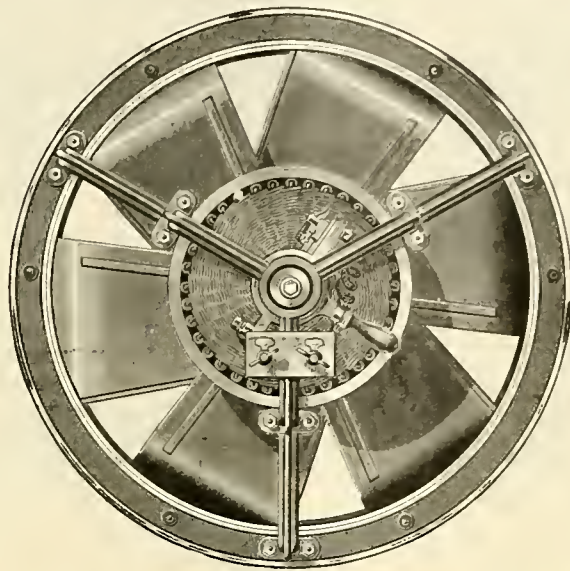
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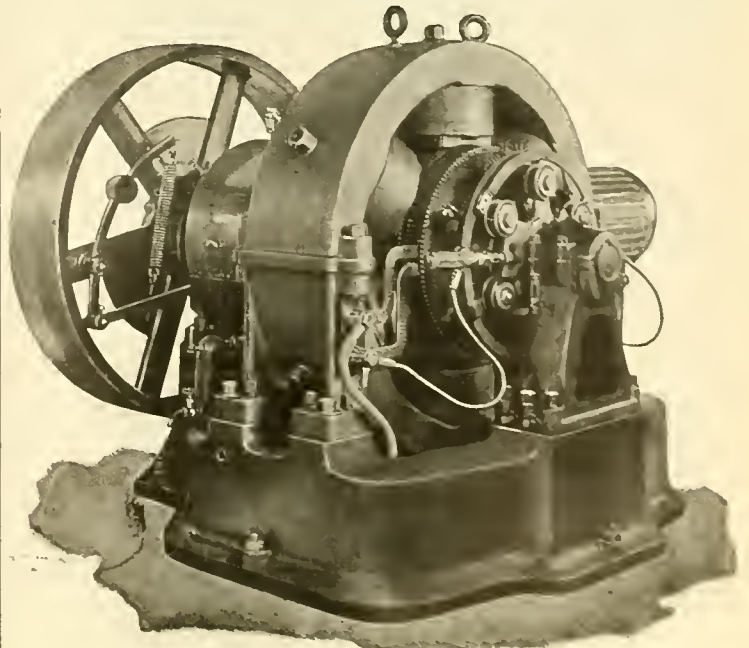
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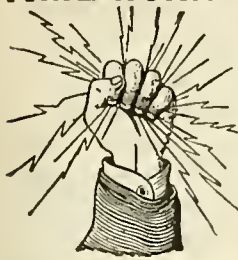
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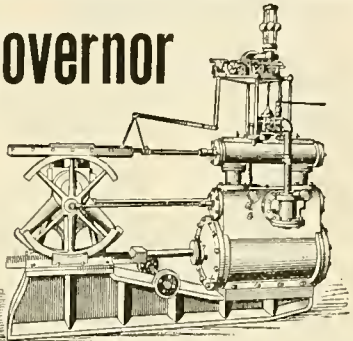
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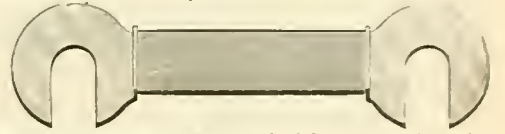
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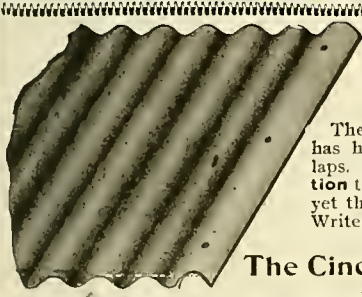
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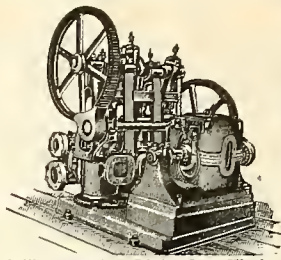
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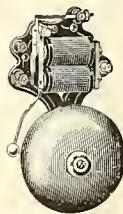
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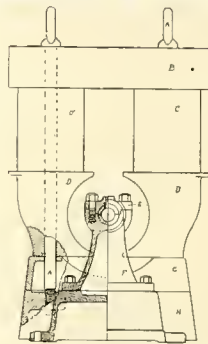


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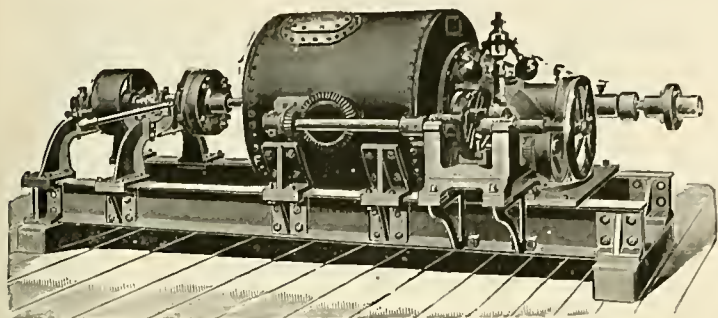
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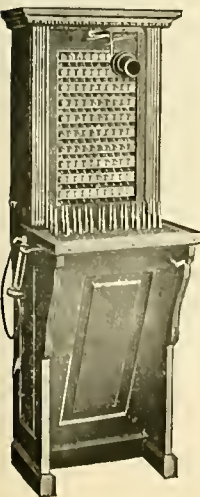
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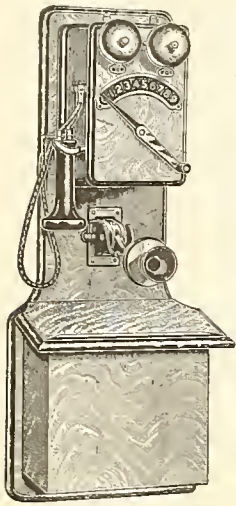
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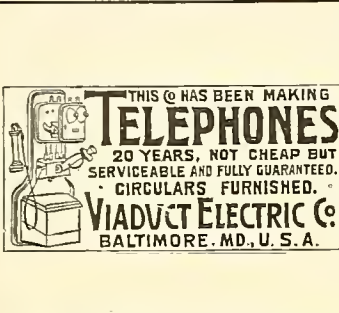
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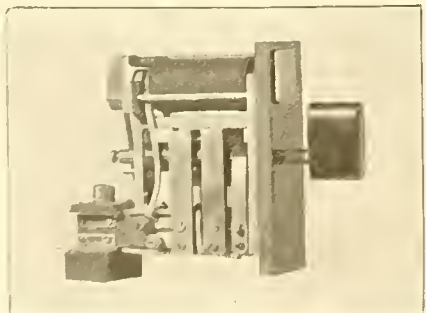


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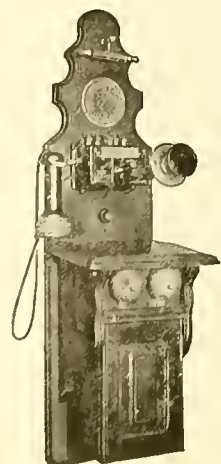
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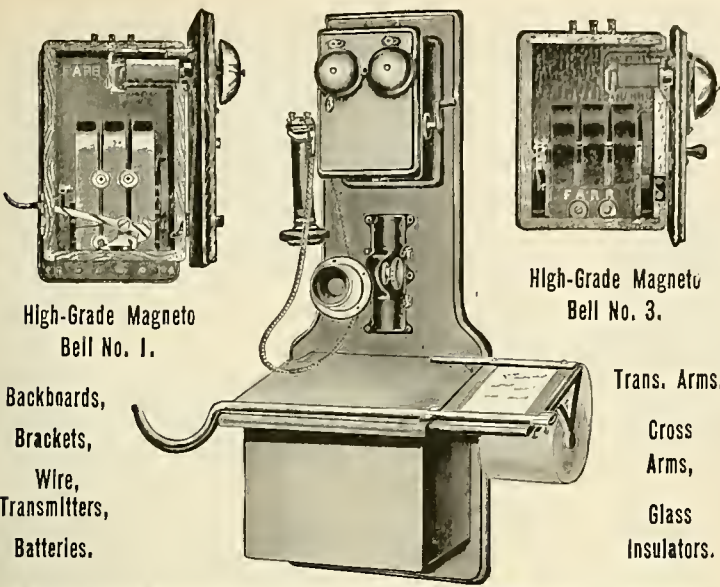
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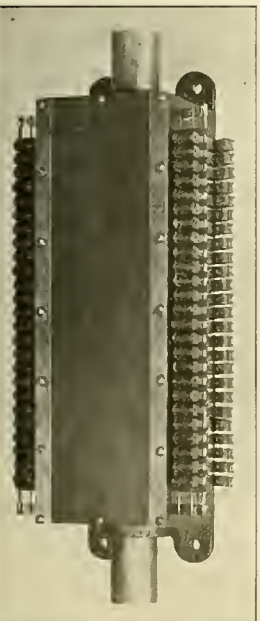
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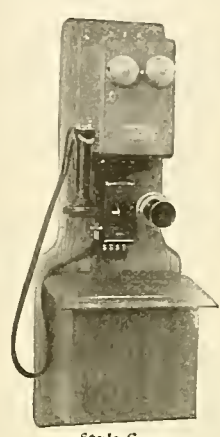
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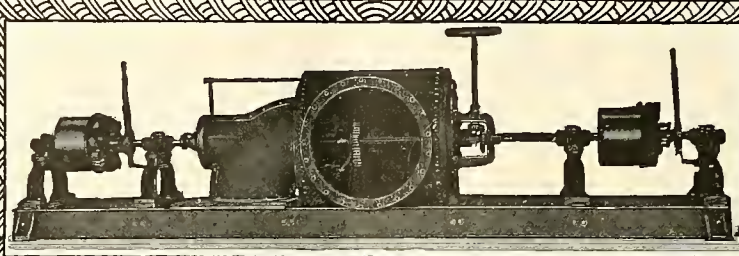
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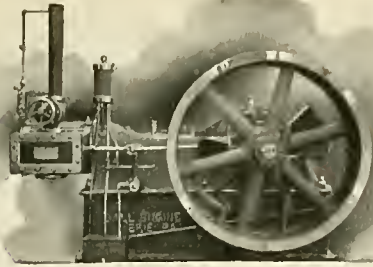
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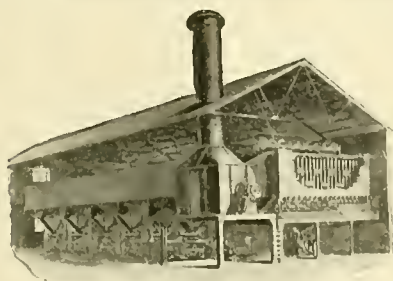
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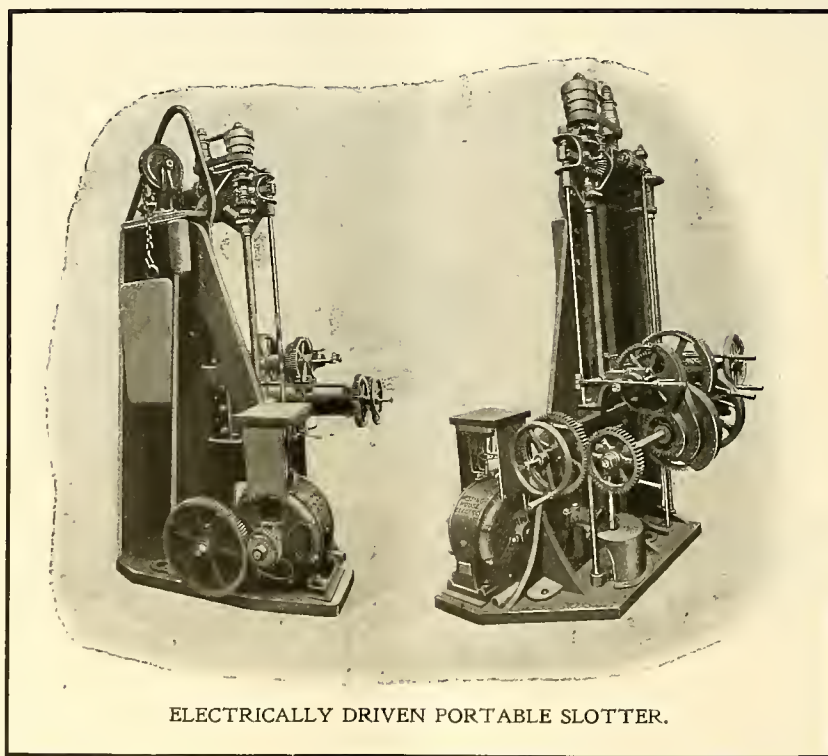


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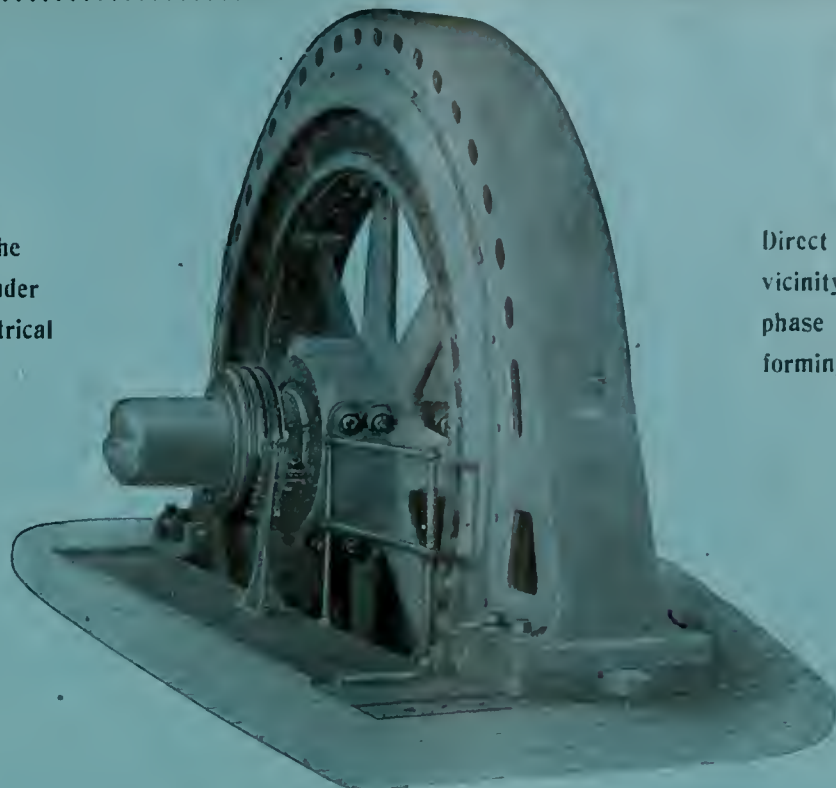
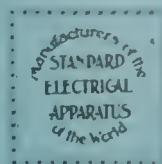
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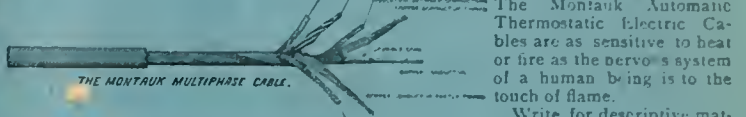
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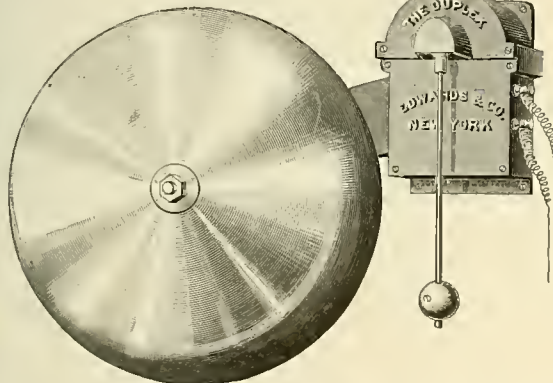
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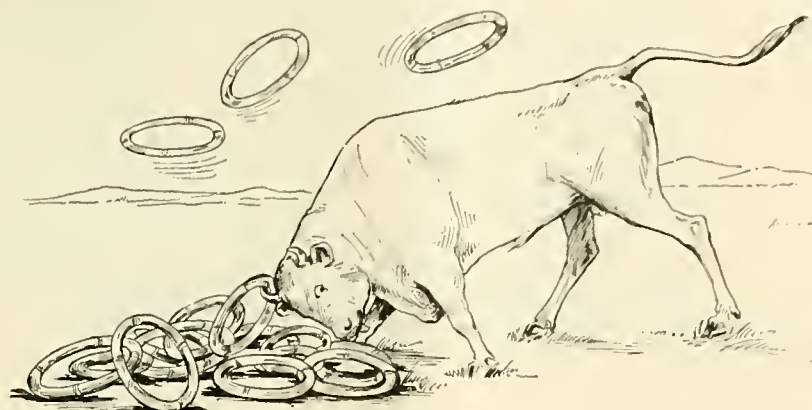
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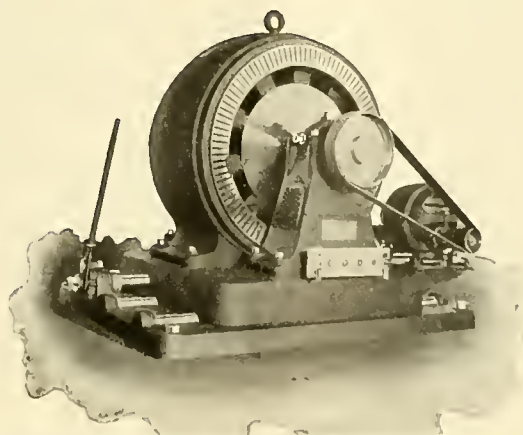
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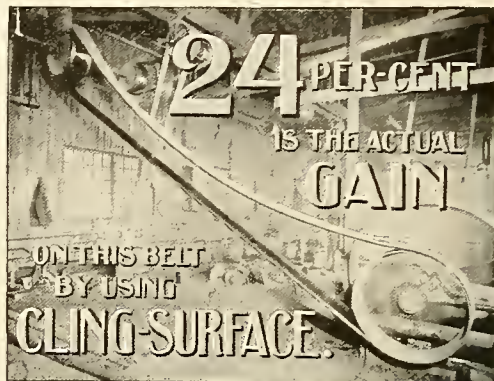
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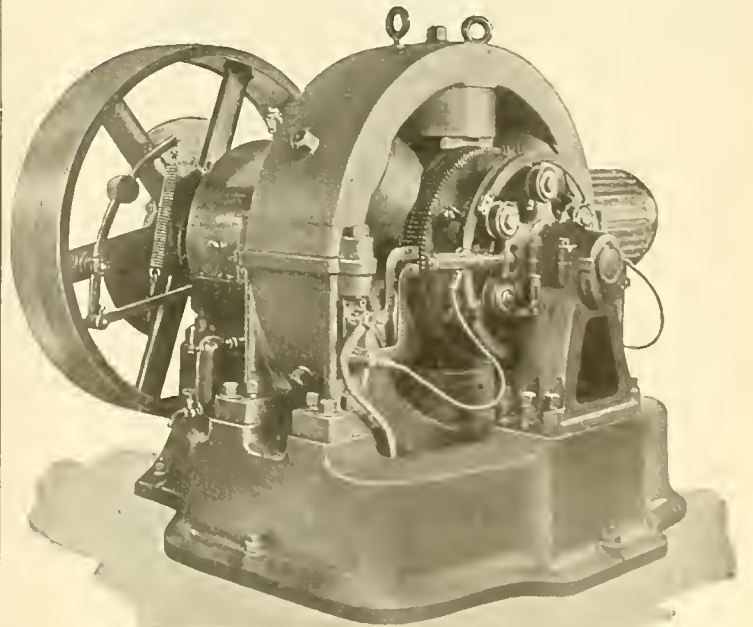
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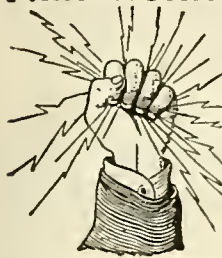
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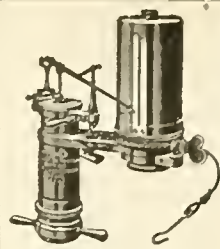
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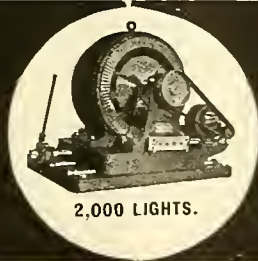
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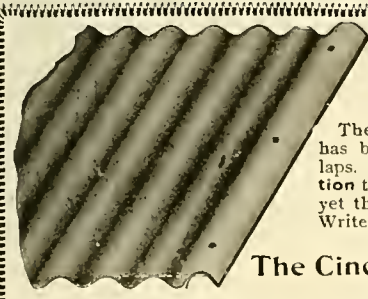
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NOTICE TO BIDDERS.

Sealed proposals will be received at the office of the City Clerk of the city of Vincennes, Indiana, until 3 o'clock p. m., Monday, February 27, 1899, for lighting the streets, alleys, parks, public buildings and public places of the city of Vincennes, for a period of ten years, with, approximately, 175 arc lamps and, approximately, 200 gas lamps.

The electric light service will begin April 29, 1900, and the gas light service will begin December 27, 1900. A 20-year franchise, covering the use of the streets for the placing of the pipes, poles, wires, appliances, etc., for the supply of gas and electricity for light, heat and power purposes to the citizens of the city will be granted to the successful bidder.

Plans and specifications and a copy of franchise ordinance may be secured from the City Clerk at Vincennes, Indiana, or from Bryan & Humphrey, the consulting engineers, at St. Louis, Mo., after Monday, February 13, 1899.

Each bid must be accompanied by a certified check, payable to the City Treasurer, for \$5,000, as a guarantee of good faith, and that the bidder will, if his proposal is accepted, enter into contract and furnish satisfactory bond in the sum of \$20,000 within fifteen days of the acceptance of his proposal for the faithful execution of said contract.

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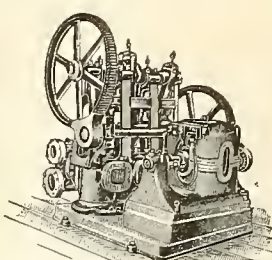
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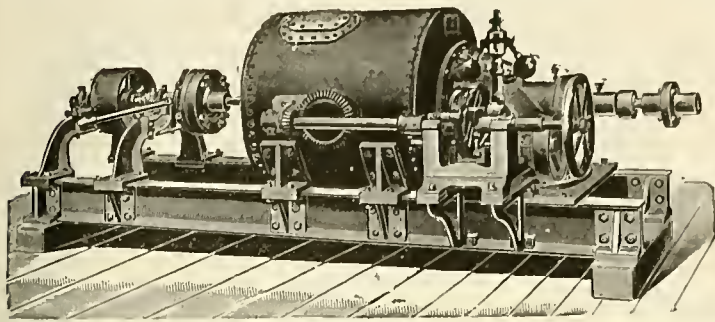
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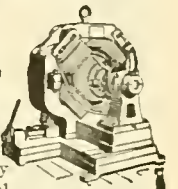
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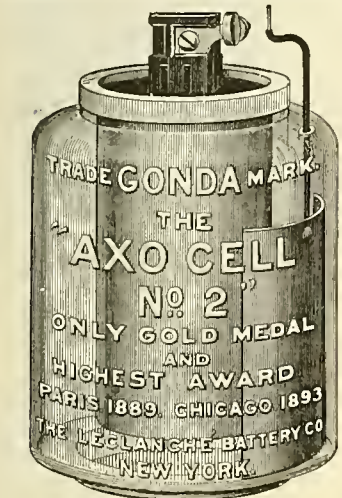
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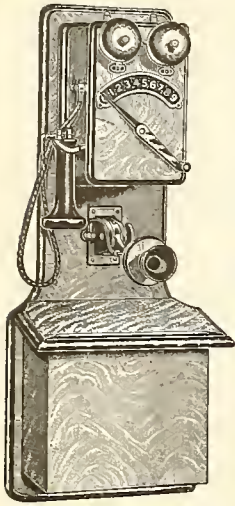
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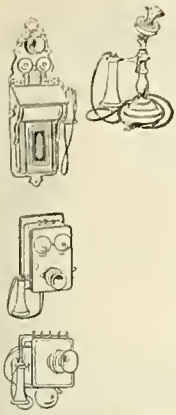
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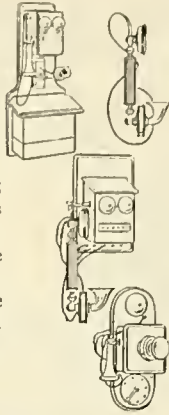
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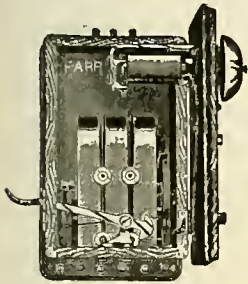
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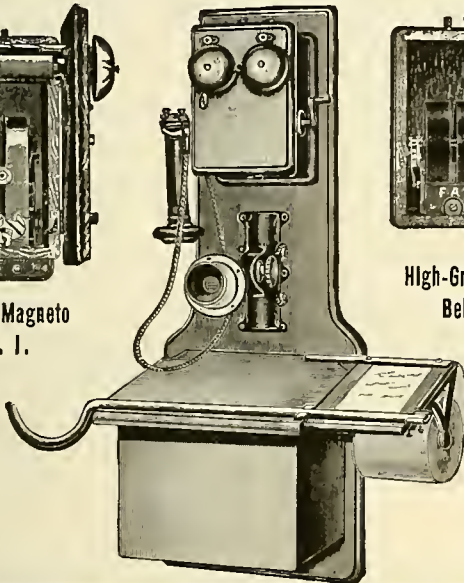


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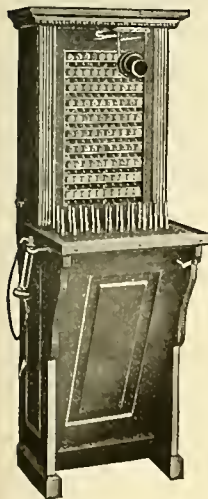


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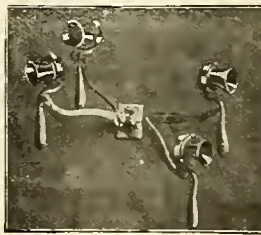
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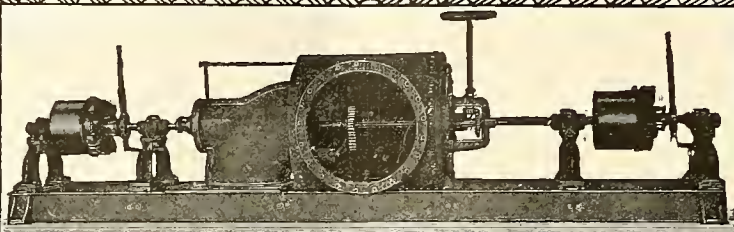
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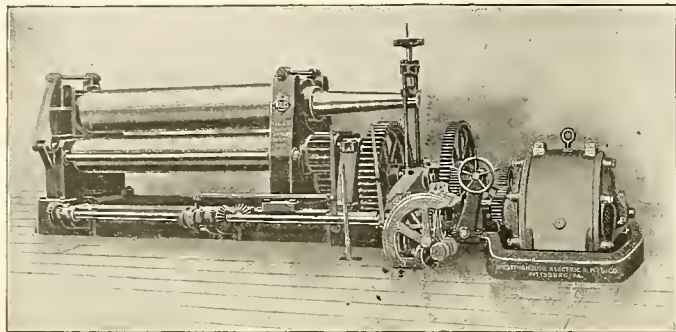
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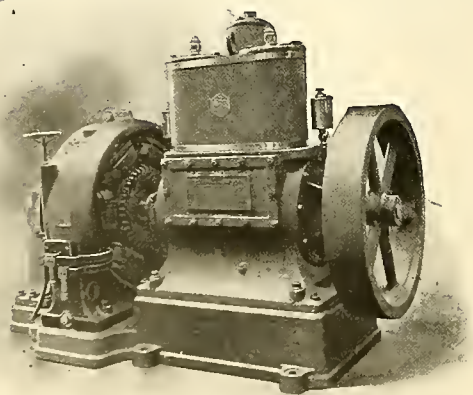
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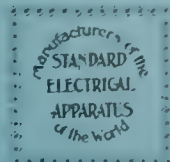
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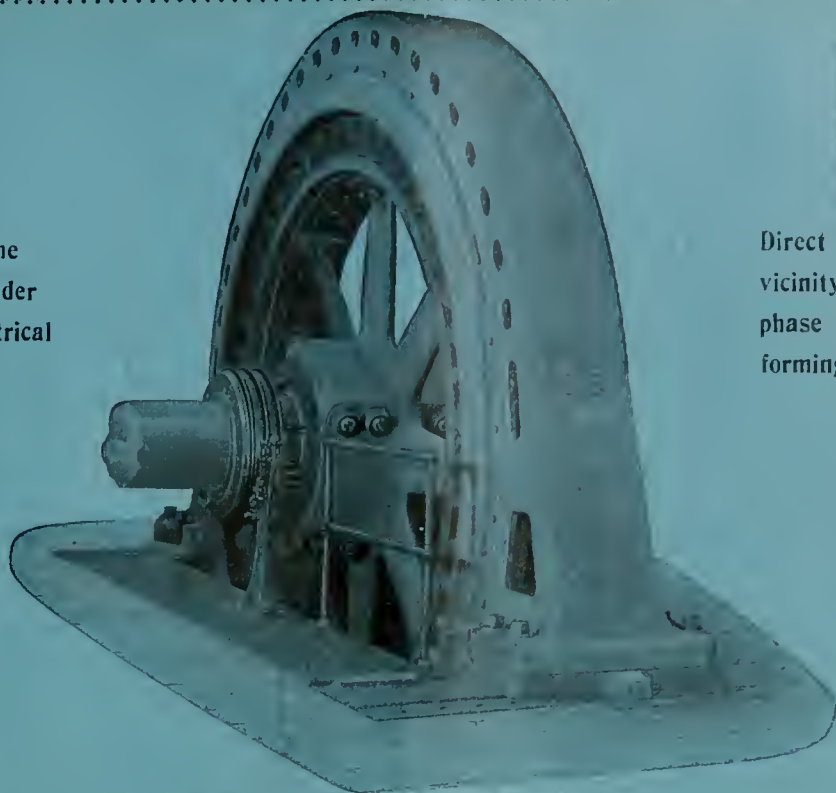
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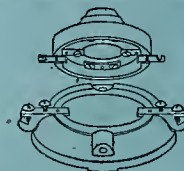
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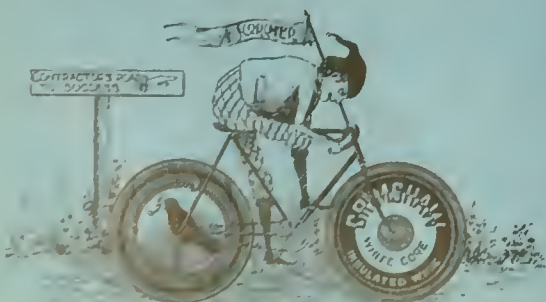
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Vol. XXIV.

CHICAGO, FEBRUARY 18, 1899.

No. 7

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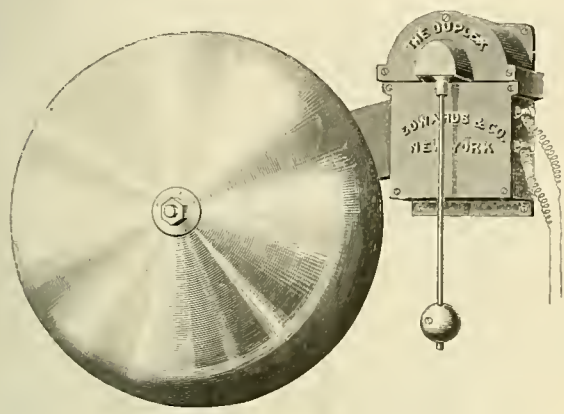
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35 light.
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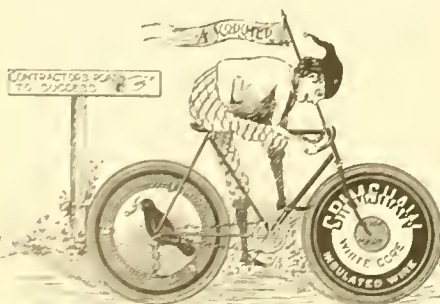
New York Insulated Wire Company,

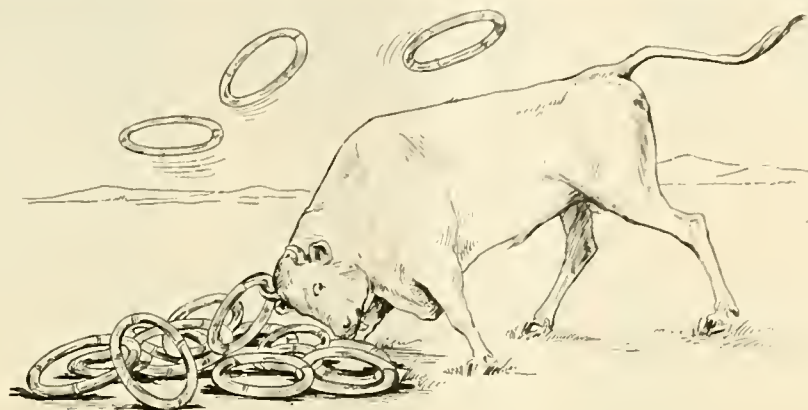
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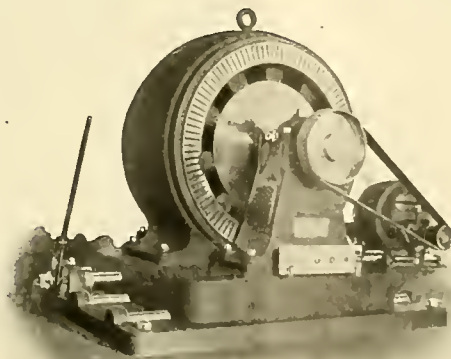
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WIRE.**



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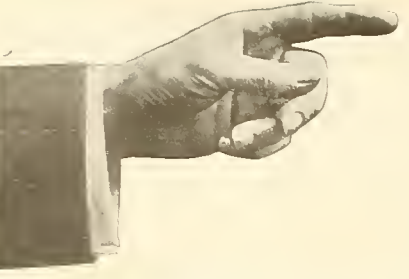
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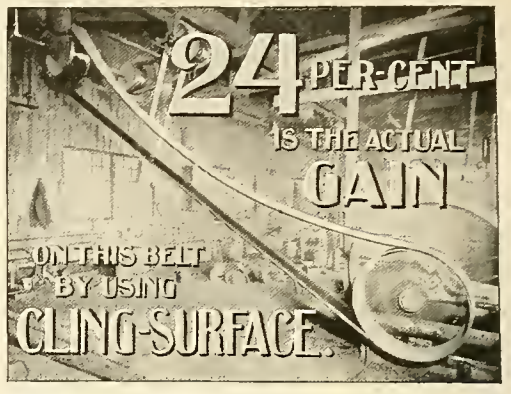
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CLING-SURFACE

on it and the increased power ON THIS ONE BELT will pay for all the CLING-SURFACE required throughout the whole plant.



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CLING-SURFACE MFG. CO.,

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BUFFALO, N. Y.

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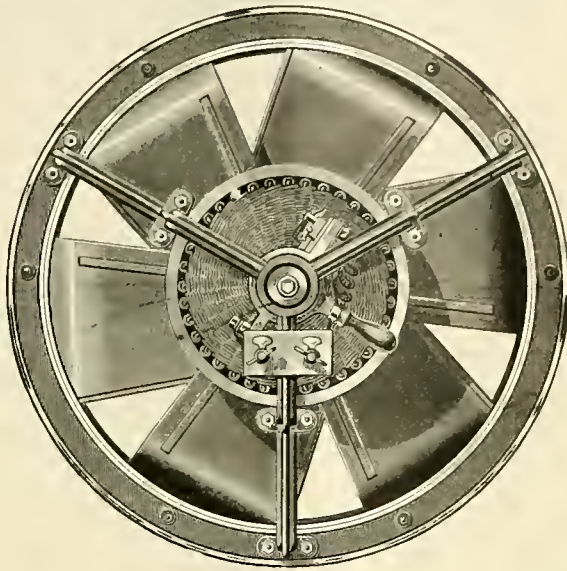
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Manufacturers of Cables, Wires, Telegraph Instruments, Electric Light Apparatus and Supplies.

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London, E. C.

ANTWERP,
33 Rue Boudewyns.

PARIS,
45 Avenue de Breteuil.

OFFICE OF

CHICAGO TELEPHONE COMPANY,

203 WASHINGTON STREET.

To Patrons of the Chicago Telephone Company and Others:

In order to correct apparent misapprehensions in regard to the object and terms of the ordinance recently applied for by this Company, it desires to make the following statement:

The present ordinance of the Company expires Jan. 8, 1909—ten years hence. An extension of twenty years is requested.

WHY?

The telephone business is comparatively a new industry. At its inception the plan was adopted of making an annual charge entitling a subscriber to an unlimited amount of service. Experience demonstrated that this produced inequalities, because the subscriber needing a small amount of service paid the same as another desiring a much greater amount. About four years ago, at different points throughout the world, efforts were made to obviate these inequalities, and what is generally agreed to be the best solution of the problem was found in what is known as "measured service."

Upon this plan the subscriber pays for outgoing calls in proportion to the number he makes. All incoming calls are free to him. The principle of basing the charge for any kind of public service upon the amount and character of service rendered is undoubtedly correct. No one would undertake to make a fixed charge by the year applicable alike to all business houses or to all residences for other kinds of service, such as electric light, gas, telegraph, mail, street car or even for water. No price could be fixed which would be fair to all, and this is equally true of telephone service. At measured rates the cost to the subscriber is based upon the amount and character of the service rendered him.

This measured-rate plan has been received with great favor in New York, Philadelphia, Boston, Buffalo and other cities. It is universally adopted in Switzerland, used largely in Germany, Norway and Sweden, and is just now being introduced in the Exchanges in London and Paris. In New York more than 80 per cent. of the subscribers have chosen to contract upon the measured-rate plan, and the average annual cost of the telephone to the user has been reduced more than 50 per cent. in that city. The result of this equalization of rates wherever introduced has been to increase the number of users because of the reductions offered and to decrease the average annual return to the Company per telephone. This has necessitated large additional investments by the Companies in those cities, in extending their plants, to enable them to place these facilities at the disposal of the increased numbers desiring them.

About three years ago this Company began to make engineering plans which would enable it to offer measured rates to its subscribers. The experience in other cities was ascertained, and lessons have been learned from it, and last April consultations were had with the Chicago city officials on the subject of offering measured rate service to the public. Last September the basis and schedule of these rates were practically decided upon by the Company.

In order to make the necessary extensions and additions to the present plant of the Chicago Telephone Company to enable it to furnish these facilities it has been found by careful estimate, in the light of experience in other cities, that an additional investment of between \$6,000,000 and \$8,000,000 would be required to be made at the rate of about \$1,000,000 a year. In brief, then, these are the reasons why the Company asks for an extension of its ordinance at this time:

First, That it may be enabled to equalize and reduce rates to present subscribers.

Second, That by reason of the reduced rates telephone facilities may be placed at the disposal of many who do not now have them.

Third, That it may be warranted in making large investment necessary to provide these facilities.

RATES.

Under the proposed new basis the Company provides a copper metallic circuit from the Exchange Office to the premises of the subscriber and installs for his use long-distance instruments and equipment of the best design now known. All incoming calls to him are free. All outgoing calls—i. e., those which originate at the subscriber's instrument and result in a communication with the line called for—are recorded. The subscriber may contract for any de-

sired number of calls, and the Company under the ordinance would be compelled to contract to furnish service at rates based upon the differences in amount and character of service at initial prices of \$40, \$60 and \$90 per annum.

At the \$40 rate a four-party line telephone is offered for private residences with the privilege of sending 400 calls to other subscribers in the Chicago Exchange without additional charge. Additional calls, up to 600, would be at the rate of 8 cents each, and from 600 to 2,000 at graded rates running from 6 cents to 3 cents each; all calls over 2,000 being at the latter rate. Incoming calls are free. There are many residences in Chicago where there are now no telephones and whose needs for outgoing communications would be well accommodated by 400 calls. There are to-day more than 500 telephones in private residences which are not used on outgoing calls more than once a day, although they are entitled to unlimited service. The subscribers for these telephones would be able to reduce their rate \$60 a year as compared with the present ordinance rate and would still have all the service they needed.

A telephone on a two-party line is offered for a place of business or private residence at \$60 per annum, with 600 outgoing calls without additional charge, incoming calls to be free. Additional calls to be at rates of 6, 5, 4 and 3 cents, according to the number sent, all calls over 2,000 being at the latter rate. There are very many business places, stores, markets, offices and establishments in almost every line of business whose needs would be served by this two-party line telephone service, and to them this plan offers a yearly reduction of \$65 or more.

At the rate of \$90 per annum an individual metallic circuit with long-distance instruments and equipment is offered with 900 outgoing calls, additional calls being at the rates of 6, 5, 4 and 3 cents, according to the number used, all calls over 2,000 being at the latter rate. A large percentage of the present subscribers for business telephones will be able to obtain a material reduction in their rates by changing to this basis. One hundred such subscribers were recently asked their opinion of this plan and forty-one signified their willingness to accept it and are anxious to change. These subscribers realize that the legitimate needs of their own business would be served by an average of about three outgoing calls per day with their incoming calls free. They do not contemplate furnishing free service for others or that their telephones will be used for frivolous or unimportant calls by employes. There are also some hundreds of present subscribers who now have two or more telephones who could effect an immediate saving without in any way impairing their service by retaining one telephone on the unlimited or flat-rate plan and putting the others on the measured-rate plan, using the latter principally for incoming calls.

We especially emphasize the fact that no present subscriber is expected to change his contract and adopt the measured rate unless he so desires. It is optional with any subscriber to continue his present contract if he so elects. The Company will continue to offer various forms of unlimited service, such as residence party lines, private branch exchanges, direct exchange lines, extension telephones, private lines and private exchange lines, as may be desired from time to time by its patrons.

PUBLIC TELEPHONES.

The Company also obligates itself under the ordinance to maintain no less than 1,200 telephones, distributed in different parts of the city, at which any citizen may make calls free to the city police, fire and health departments in emergencies. Any other local call may be had at a price not exceeding 10 cents. Public telephones in operation on the present plan are a means of affording facilities to many, but for greater public convenience it is proposed that the number of these telephones should be increased and so generally distributed as to be readily accessible to each citizen. There is no other known method by which the user can obtain such satisfactory results at so small a cost to him. This service is cheaper than telegraph or messenger, quicker and more complete than the mail, as cheap as car fare and always a saver of time and money. If the user does not secure the communication for which he asks it costs him nothing.

On the other hand, it is costly and not very remunerative to the Company. The compensation to persons in whose premises these telephones are in-

stalled consumes a large portion of the receipts and also requires a large amount of free service. Experience has shown that about one-third of all the calls from these telephones are free. The cost of operation, maintenance and the mere cost of collection are much more expensive than for any other telephone. The average revenue from them is considerably less than the revenue authorized by the present ordinance. This average will certainly decrease as the number is increased under the proposed ordinance. Many of them would be maintained at an actual loss to the Company, as is now the case, but the public would be benefited by having them available for use when needed by the citizens in their vicinity.

COMPENSATION TO BE MADE TO THE CITY.

It may not be generally understood that the territory of the Chicago Telephone Company embraces not only the city of Chicago and the county of Cook, but also McHenry, Lake, Kane, DuPage, Kendall, Grundy and Will counties in Illinois, and that it operates Exchanges in more than a hundred places outside of Chicago, some of them large and growing cities, such as Aurora, Elgin, Joliet, Evanston, Waukegan, etc., etc. The compensation named in the ordinance is in payment for privileges granted by the city of Chicago. All will admit that there would be no reason or justice in claiming compensation out of receipts from territory beyond that in which the ordinance conferred rights.

The highest sum that has ever been due from the Company to the city as tax on its gross earnings, under the terms of its ordinance, was \$46,907.95. The average annual sum paid since the ordinance went into effect (ten years ago) has been \$33,725.35.

The Company estimates that the measured rates proposed would reduce the earnings from its present subscribers not less than \$200,000 per annum, and probably more. In view of the proposed lower rates and consequent reduced receipts the Company believed that a lump sum of \$50,000 per annum (which is considerably larger than has yet been reached, and in view of all the circumstances possibly larger than would be reached in many years) would be regarded as an advantage to the city, as its revenue from this source would thereby be relieved from any of the uncertainties of business.

It should not be forgotten that in addition to the compensation provided in the present ordinance, which includes a limited amount of free telephone service and the right to string city police and fire alarm wires on the poles of the Company, additional compensation is now offered by largely increasing the amount of free telephone service and in giving conduit and pole line rights, which the city needs for street lighting and other purposes, and which it could not equip itself to supply for less than \$1,000,000. These additions would be worth to the city a net sum of certainly not less than \$50,000 per year. The total compensation offered by the Company in the new ordinance amounts to not less than \$100,000 per annum, and during the term of the ordinance would aggregate \$3,000,000.

CONCLUSION.

The Company asks for these amendments to its ordinance in perfect good faith and believes that they are fair to all parties interested. If the Council shall decide to pass the ordinance asked for and the Mayor shall approve the same the Company will faithfully carry out the increased obligations which it imposes and immediately proceed to extend its plant and to introduce the lower rates. Whatever may be the outcome of the application to the City Council the Company will continue its endeavors to give to the citizens of Chicago the best telephone service possible and will spare no reasonable expense to that end.

CHICAGO TELEPHONE CO.,

By JOHN M. CLARK, President.

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Byron L. Smith,
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EUGENE F. PHILLIPS,
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PROVIDENCE, R. I.

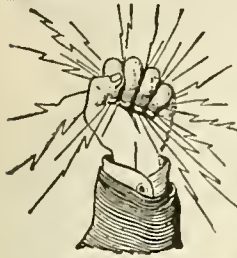
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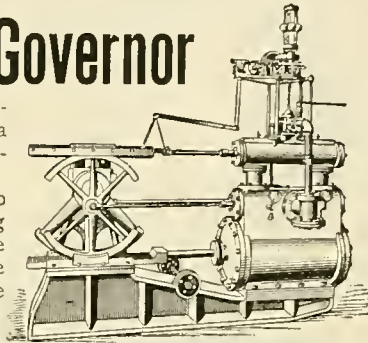


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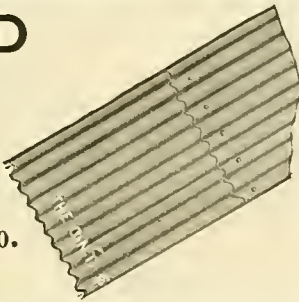
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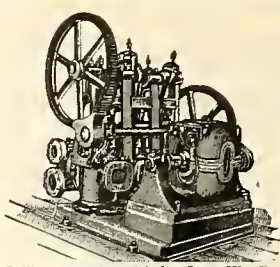
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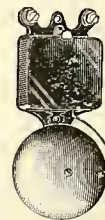
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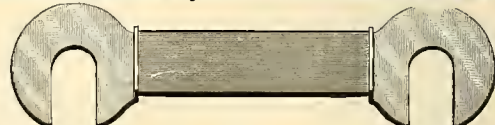


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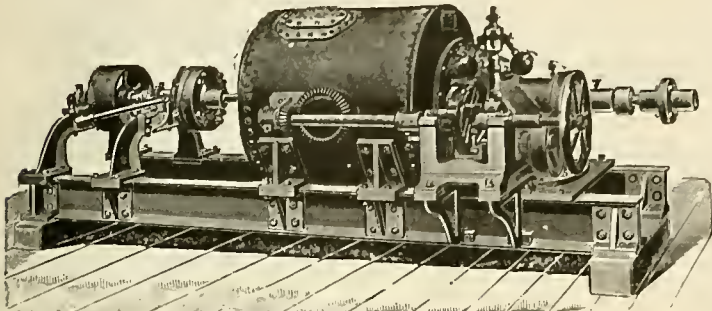
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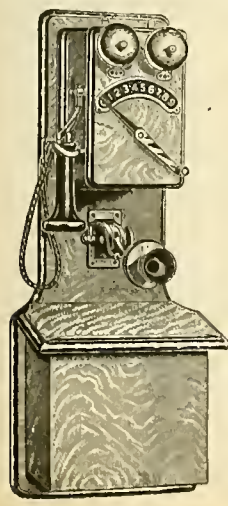
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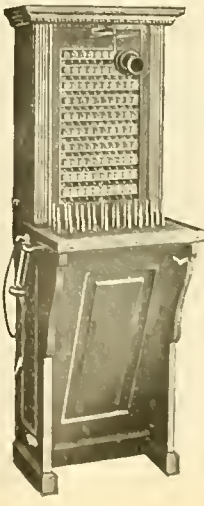
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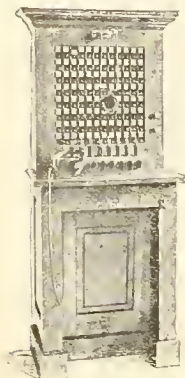
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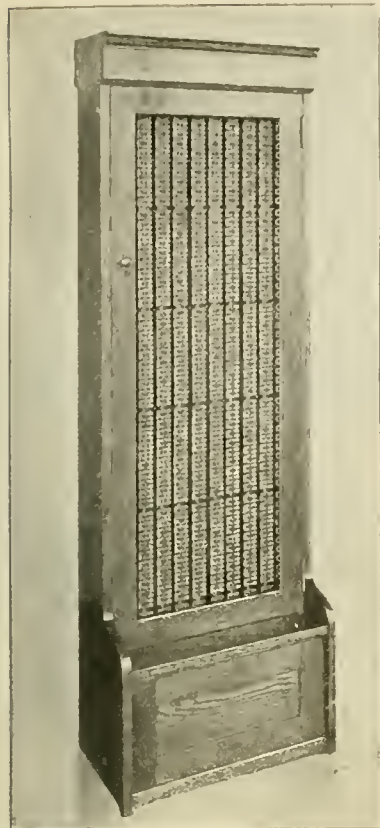
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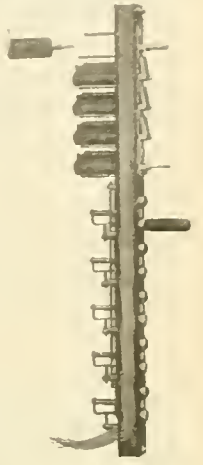


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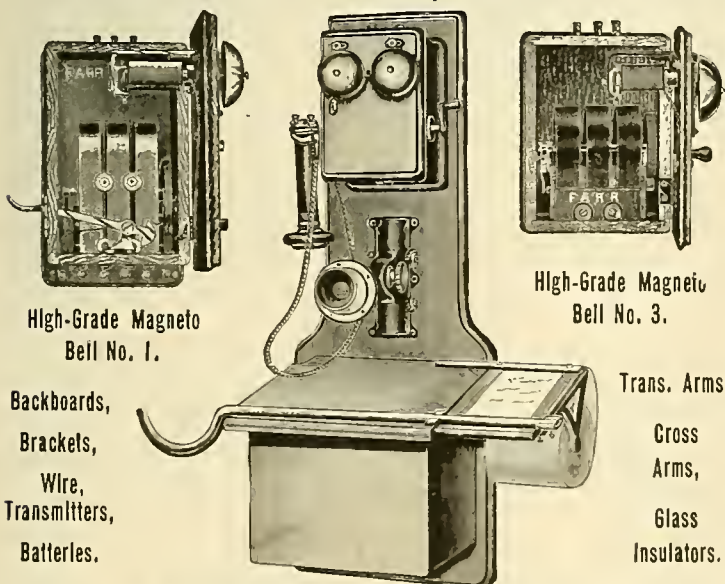
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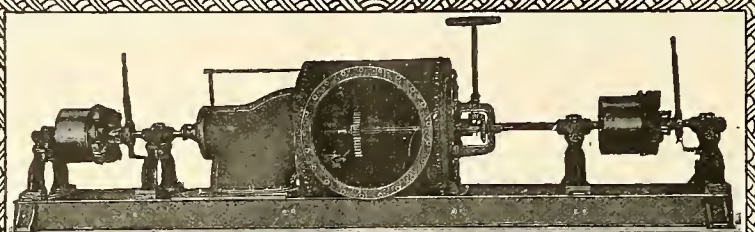
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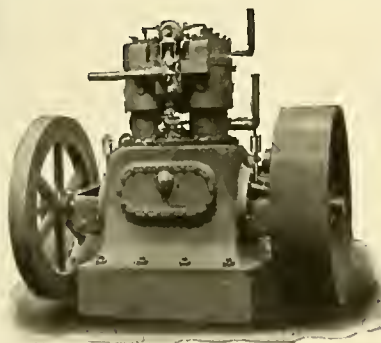
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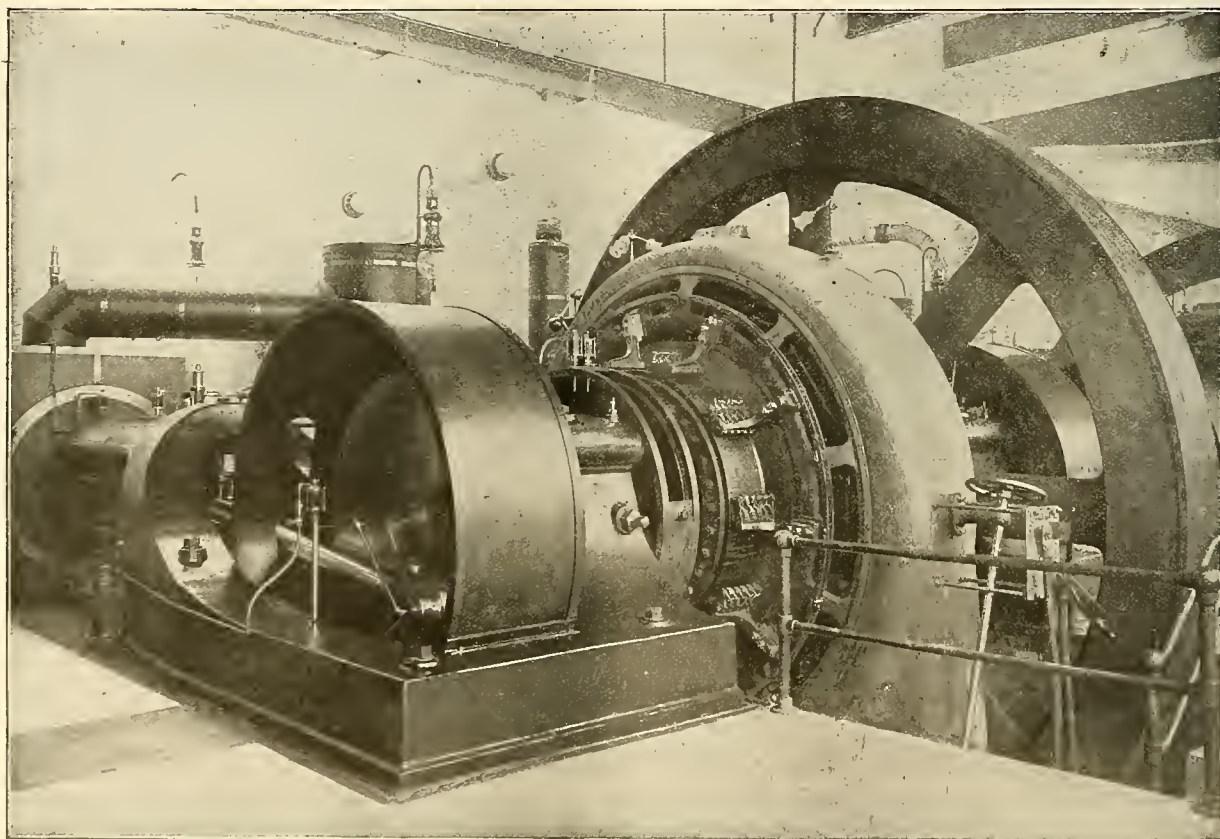
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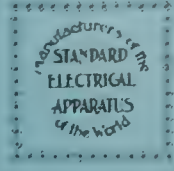
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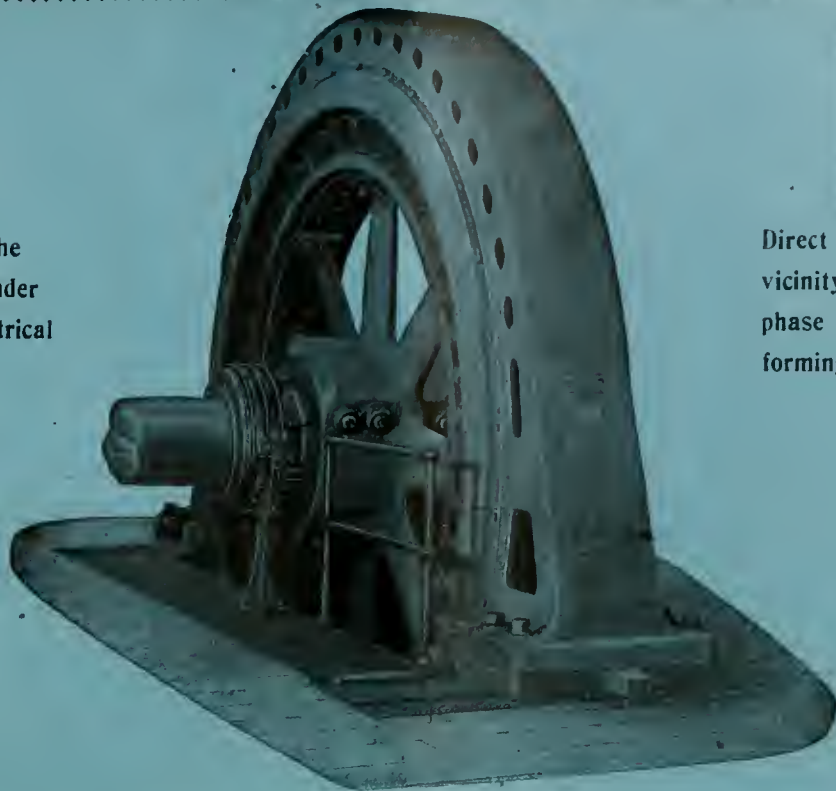
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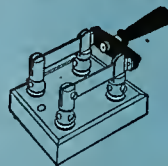
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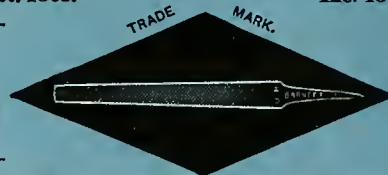
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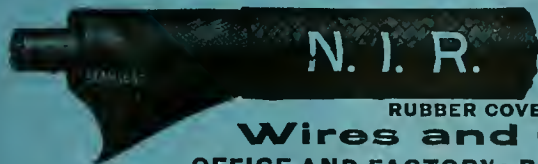
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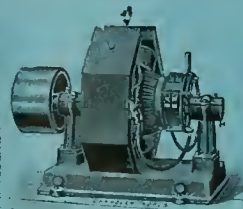
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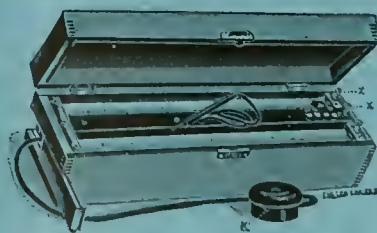
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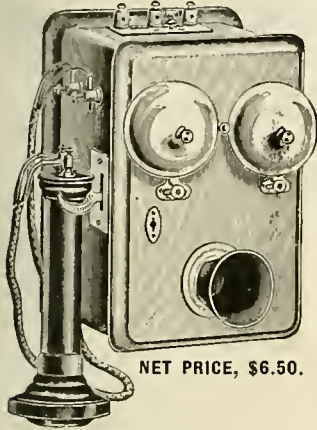
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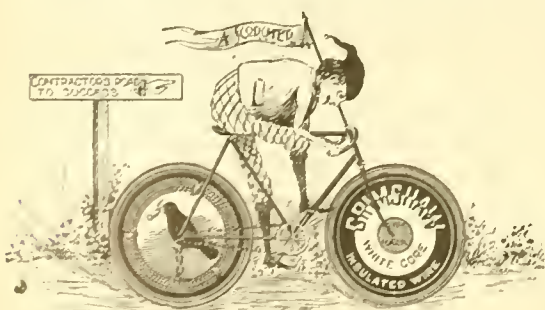
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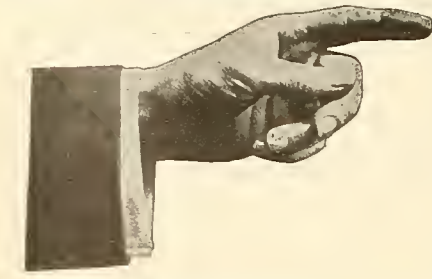
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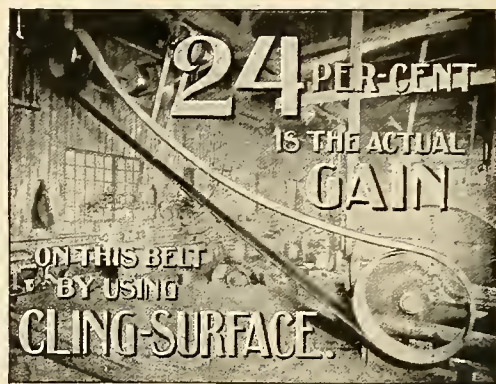
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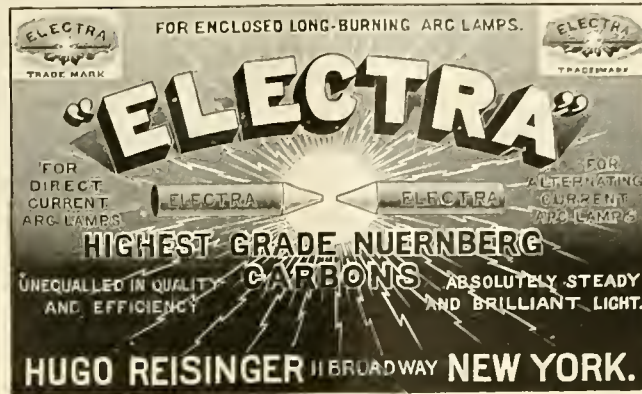
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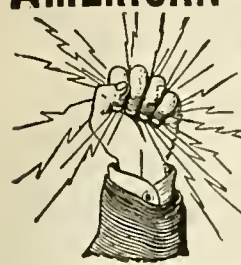
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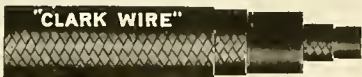
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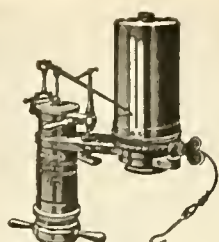
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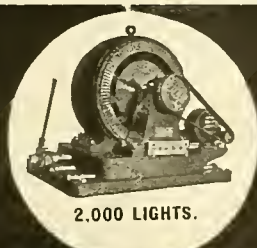
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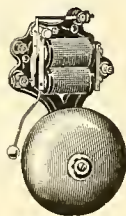
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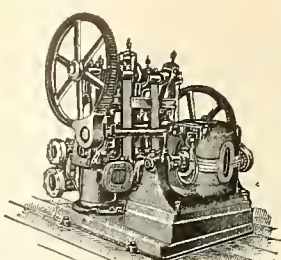
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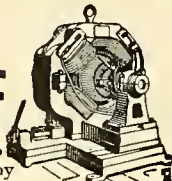
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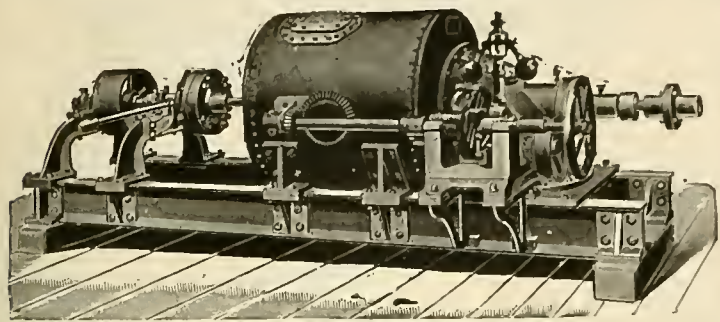
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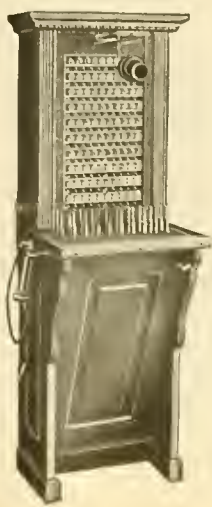
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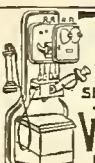
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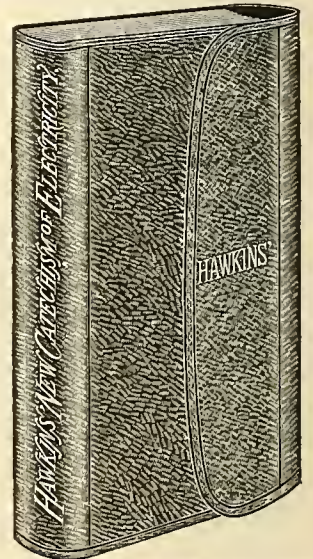
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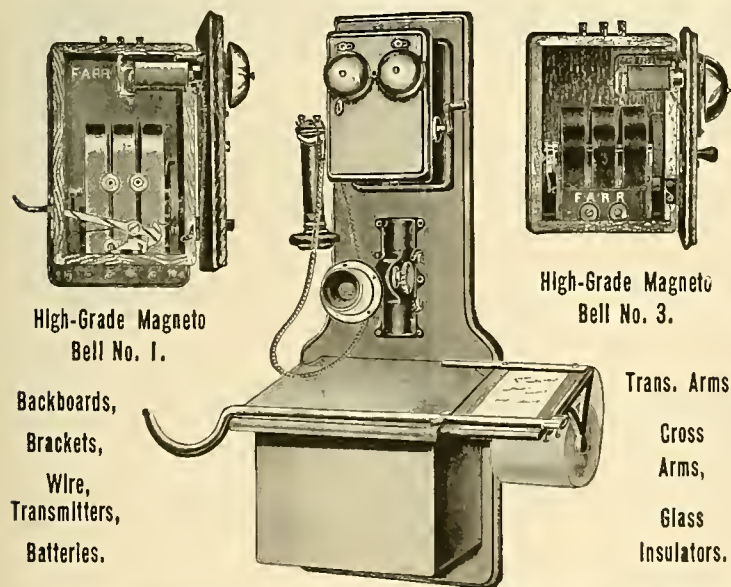
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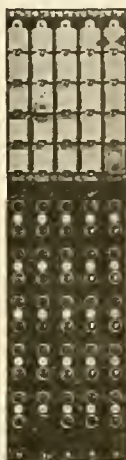
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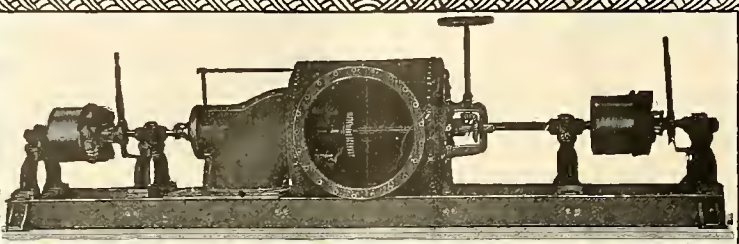
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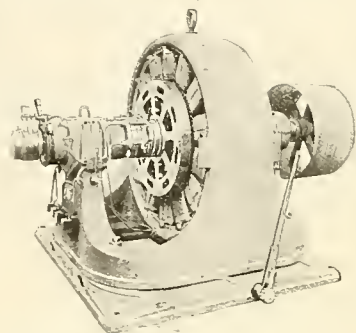
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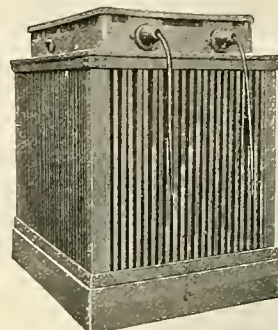
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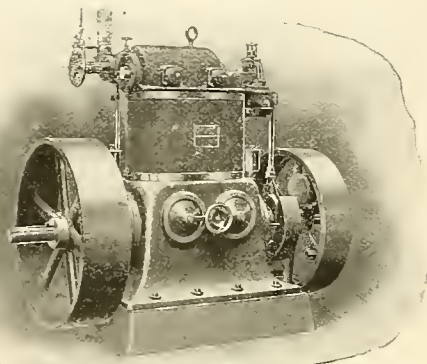
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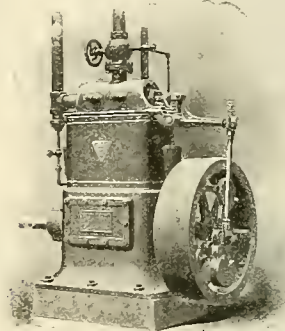
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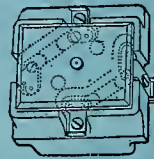
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PARTRICK, CARTER & WILKINS, 125 South Second St., PHILADELPHIA.



TRADE MARK

1889—Paris Exposition,
Medal for Rubber Insulation.
1893—World's Fair,
Medal for Rubber Insulation.

THE STANDARD FOR
RUBBER INSULATION.

Sole Manufacturers of

Okonite Wires, Okonite Tapc, Manson Tape, Candee ^{Weather-}proof Wires.
THE OKONITE CO., LTD.

Willard L. Candee, Managers. 253 Broadway, New York. Geo. T. Manson, Gen'l Supt
E. Durant Cheever, Secy. W. H. Hodgins, Secy.

30% TO 50% SAVED!

Why not make this big saving in your lamp bills? Write us for full particulars, prices and circulars.

LYNN INCANDESCENT LAMP CO.,
LYNN, MASS.

ROEBLING

Rubber Wire
and Cables.

The Only Fire Detective Cable in the World.

Every Fractional Part of which is continuously Thermostatic, and designed for all Interior Electric Wiring Adaptations. It lights the gas! Rings the door bells! It automatically notifies of fire and indicates that burglars are at work, all in one installation.



THE MONTAUK MULTIPHASE CABLE.

Why use dormant wires? The Montauk Automatic Thermostatic Electric Cables are as sensitive to heat or fire as the nervous system of a human being is to the touch of flame.

Write for descriptive matter.

ter. Call and see cables operated.

MONTAUK MULTIPHASE CABLE CO.,

Telephone 4031 Cortlandt.

100 Broadway, NEW YORK.

Insulating Paint & Varnish.

We were the first chemists in the world to make a special study of this problem. Our long experience and careful investigation enables us to be of service to wide-awake electricians.

MASSACHUSETTS CHEMICAL COMPANY,
Boston, Mass., U. S. A.



The Brady Mast Arms.

T. H. Brady, New Britain, Conn., U. S. A.

Manufacturer of Mast Arms, Pole and Swinging Hoods, House Brackets and other Specialties for Construction Work.—Catalogues and Prices furnished on application.

THE PHOENIX GLASS CO.

MANUFACTURERS OF

GAS AND ELECTRIC
GLOBES, SHADES, Etc.

HAVE YOU A COPY OF OUR No. 8 CATALOGUE? IF NOT, SEND FOR IT.

Pittsburgh. New York. Chicago.

Queen & Co.,

1012 Chestnut St., PHILADELPHIA.

Acme Testing Sets, Queen-Wirt
Switchboard Instruments, X-Ray
Focus Tubes, Induction Coils

I-T-E CIRCUIT BREAKERS

CUTLER ELECTRICAL CO., PHILADELPHIA



Standard Underground Cable Co.

542 The Rookery, Chicago. Westinghouse Bldg., Pittsburgh. 18 Cortlandt St., New York City. 125 Betz Bldg., Philadelphia, Pa.
507 Security Building, St. Louis, Mo.

Electric Cables, Conduits, Wires and Accessories.
Also High Grade Rubber Covered Wires and Cables.



THE TIPLESS LAMPS THE SHELBY ELECTRIC CO. SHELBY, OHIO.

WESTON Electrical Instrument Co.,

114-120 William St., NEWARK, N. J., U. S. A.

Weston Standard Portable Direct Reading

Voltmeters, Millivoltmeters, Voltammeters,
Ammeters, Milliammeters,

Ground Detectors and Circuit Testers,
Ohmmeters, Portable Galvanometers.

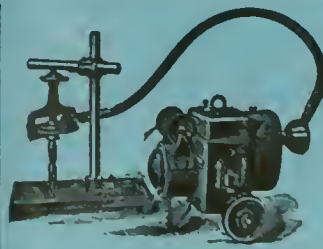
Our Portable Instruments are recognized as The Standard the world over. The Semi-Portable Laboratory Standards are still better.

Our Station Voltmeters and Ammeters are unsurpassed in point of extreme accuracy and lowest consumption of energy.

Mention the WESTERN ELECTRICIAN when writing for catalogues



Weston Standard Portable Direct Reading Voltmeter.



ESTABLISHED 1875

COMBINATION OF Stow Flexible Shaft

—AND—
IRON CLAD ELECTRIC MOTOR.

Practically dust and water proof. For Portable Drilling, Tapping, Roaming, Emery Grinding, etc. Write for Catalogue and Prices

STOW MFG. CO., Binghamton, N. Y.
Gen'l European Agents, Selig, Sonenthal & Co.,
85 Queen Victoria Street, London, England



The Direct Reading Ohmmeter

WILL ACCURATELY MEASURE RESISTANCE ON A RAPIDLY MOVING ELECTRIC CAR.

No other instrument can do this. A boy can use it. The only one of its kind.

The American Electric Specialty Co.,
123 Liberty St., NEW YORK CITY

ANOTHER VICTORY.

The U. S. Court of Appeals (final) in its February term decided the Roosevelt patent case in favor of the

WESTERN TELEPHONE CONSTRUCTION COMPANY,

Again demonstrating that this company is

SOUND AND RELIABLE.

The Western Telephone Construction Company Owns Patent No. 521,461,

Being the first patent covering all forms of switchboard where the "drop" is automatically restored by the plug.

We claim that the switchboards of the American Electric Telephone Company (P. C. Burns) infringe this patent. We have brought suit against them in the U. S. Court, which is now being vigorously prosecuted. We notify all persons of our confidence that we will stop the use of these infringing switchboards.

WESTERN TELEPHONE CONSTRUCTION COMPANY,

250 S. CLINTON ST., CHICAGO.

NOTE: LARGEST INDEPENDENT MANUFACTURERS OF TELEPHONES AND SWITCHBOARDS IN THE UNITED STATES.

THE TELEPHONE HAND-BOOK

BY HERBERT LAWS WEBB.

Member of the American Institute of Electrical Engineers, and of the Institution of Electrical Engineers, London. Author of "A Practical Guide to the Testing of Insulated Wires and Cables." Joint Author of "Electricity in Daily Life."

146 Pages, 138 Illustrations, Cloth, Hand-Book Size, Price \$1.00.

EXTRACT FROM PREFACE.

This little book has no pretension to be considered a complete treatise on telephony as it exists in America. The time for such a work is not yet come. But it is felt that there is a demand for a practical book on telephone working and management, and the TELEPHONE HAND-BOOK is an attempt at meeting that demand. With the exception of a few chapters dealing with certain forms of transmitters and receivers used in Europe, which are given for the information of those who may wish to engage in the manufacture of telephones, the book is based entirely on standard American practice, and most of the material, apparatus and methods described are peculiar to or have originated in this country.

No pains have been spared to make it the best book of its kind. It is right up to date, intensely practical, and so plain and clear in its language that anyone can understand and learn from it everything regarding telephone work and management. It conforms in size and style to our other Hand-Books which have been so favorably received by the entire electrical fraternity.

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<p>CHAPTER 1. The Invention of the Telephone.</p> <p>2. Sound Waves. Articulate Speech.</p> <p>3. Electric Telephony. The Bell Telephone.</p> <p>4. The Microphone.</p> <p>5. Current Induction. Electromagnetic Induction.</p> <p>6. The Induction Coil: Its Use in the Telephone Transmitter.</p> <p>7. The Complete Telephone Circuit.</p> <p>8. Magnet Telephones.</p> <p>9. The Bell Telephone Receiver.</p> <p>10. Other forms of Magnet Receivers.</p> <p>11. The Gower, Ader and D'Arsonval Receivers.</p> <p>12. Mercader's Bell Telephone.</p> <p>13. The Siemens, Kolyva, Schumayer and Kellner Receivers.</p>	<p>CHAPTER 13. Carbon Transmitters.</p> <p>14. The Blake Transmitter.</p> <p>15. The Long Distance Transmitter.</p> <p>16. The Solid-back Transmitter.</p> <p>17. The Bellier Transmitter.</p> <p>18. The Cutler's Transmitter.</p> <p>19. Various European Transmitters.</p> <p>20. The Efficiency of Carbon Transmitters.</p> <p>21. Batteries for Telephone Work.</p> <p>22. Open Circuit Batteries.</p> <p>23. Closed Circuit Batteries.</p> <p>24. The Practical Management of Batteries.</p> <p>25. Magneto Bell.</p> <p>26. Automatic Switches.</p> <p>27. Telephone Line Construction.</p>	<p>CHAPTER 28. Metallic Circuit.</p> <p>29. Underground Wires.</p> <p>30. Lightning Arresters.</p> <p>31. Inside Wiring.</p> <p>32. Installation of Telephone Instruments.</p> <p>33. Inspection and Maintenance.</p> <p>34. The Condenser: Its Use in Telephony.</p> <p>35. Electromagnetic Retardation.</p> <p>36. Exchange Working.</p> <p>37. Small Exchanges.</p> <p>38. Party Lines: The Bridging Bell.</p> <p>39. Long Distance Telephony.</p> <p>40. Duplex Telephony.</p> <p>41. Simultaneous Telegraphy and Telephony.</p> <p>Appendix.</p>
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The "Chloride Accumulator"

ON THE SYSTEM OF

THE SOUTH SIDE ELEVATED RAILROAD COMPANY, CHICAGO.

From the Annual Report of the President, Jan. 26, 1899.

Storage Batteries.

"While the amount of current used per car mile is low, and has produced gratifying results in all tests and comparisons made, the fluctuations of power above the average requirements are large, and the sudden demands on the power-house compelled us to prepare promptly for the heavier business of the winter, which, with increased number of cars in service, heat and light loads, would have been beyond the capacity of the power-house. Additional engine capacity could not be obtained in the time at our disposal, would have cost more money, and have been expensive to operate. We accordingly installed two batteries of 750 K. W. each, equidistant from the power-

house, at Twelfth and Sixty-first streets, respectively. These batteries have very greatly reduced the fluctuations and the maximum load at the power-house. While the output at the power-house is the same, the batteries charge at times of light traffic and discharge at times of heavy traffic, thus equalizing the work at the power-house, and relieving the engines and generators. This is certainly an economy, and it is further claimed, with what correctness I am not yet convinced that they cheapen the cost of production. But I do know that they keep up the voltage at the ends of the line, enable your road to operate more cars, furnish increased facilities to patrons, and prevent damage to power-house machinery in case of sudden demand for increased power.

Bulletins describing this and other installations of Chloride Accumulators will be furnished upon request.

TRADE MARK
"Chloride Accumulator"

REGISTERED SEPTEMBER 11, 1894.

SALES OFFICES:

NEW YORK, 20-22 Broad St.
BOSTON, MASS., 60 State St.
CHICAGO, ILL., Marquette Bldg.
CANADA, The Canadian General Electric Co., Limited, Toronto, Ont.
SAN FRANCISCO, CAL., The Parrott Bldg.
BALTIMORE, MD., Equitable Bldg.
CLEVELAND, O., New England Bldg.

THE ELECTRIC STORAGE BATTERY COMPANY,

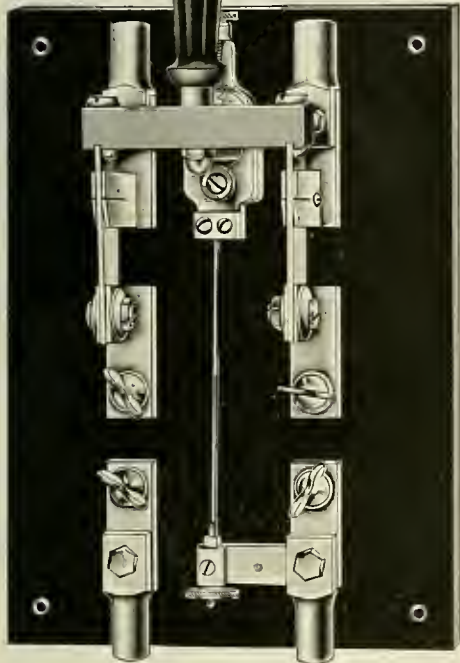
Drexel Building, Phila., Pa.

CATALOGUES.

Patented February 8, 1898.

Advantages of Buffalo Expansion Circuit Breakers.

- 1st. Simplicity.
- 2d. No fuses to replace.
- 3d. Low cost, little more than knife switch.
- 4th. Better than magnetic circuit breaker for motor work.
- 5th. Better than fuses for overload or short circuit.
- 6th. May be adapted to existing switches and switchboards.
- 7th. Can be placed in junction boxes on various floors where expense of magnetic circuit breakers would be prohibitive.
- 8th. For street railway cut-out boxes saves trouble of conductor replacing fuses.
- 9th. Good for direct or alternating currents.
- 10th. A 100 or 200 ampere switch may be opened on 1/2 ampere by simply changing expansion rod.
- 11th. The loss of energy is no more than with fuses.
- 12th. The switch is operative without any relation to the protective device.



The "BUFFALO" Expansion Circuit Breaker

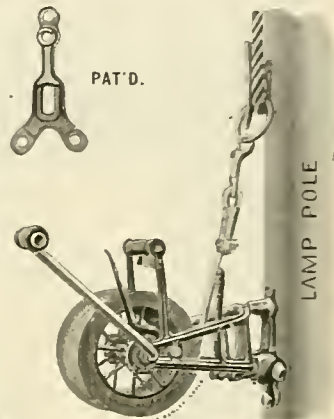
Manufactured by

McCarthy Bros. & Ford,

45 N. Division Street, BUFFALO, N. Y.

DETACHABLE WINDLASS.

The windlass shown in the accompanying illustration is designed to raise and lower electric lamps for trimming. Only one windlass is required to each trimmer and it can be attached or detached in a second's time. Each lamp pole is provided with an iron socket, which is permanently and securely fastened to the pole by three lag screws, and when the windlass is once attached to the socket it cannot become loosened by accident, making it as safe as if it were bolted direct to the pole. It is very light (weighing only about five pounds), strong and neat, being nickel-plated and enameled, and all parts liable to wear are adjustable.



A MONEY SAVER.

One windlass to each trimmer answers the same purpose as a windlass attached to each lamp pole, and as each windlass is provided with sufficient rope to lower the lamp, only enough rope is required to be attached to the lamp to extend down the pole in easy reach of the trimmer.

Another advantage is that the handling of snowy, icy and muddy ropes is avoided, leaving the trimmer's hands in a condition to handle the lamp and rods without smearing them over with mud, which is difficult to avoid if he must grapple in the snow and mud after a rope.

WESTERN AGENTS:

ILLINOIS ELECTRIC CO.,

239 MADISON STREET, CHICAGO, ILL.

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Chicago Edison Co. 1v, x	"For Sale" Advs..... x	Leelancho Battery Co... xl	Partrick, Carter & Wilkins 1	Stow Mfg. Co..... 1	Wyckoff Creosoting Co. xvii
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Ching-Surface Mfg. Co... vi					
Commercial El. S. Co..... —					

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HARDTMUTH CORED AND SOLID CARBONS

FOR DIRECT CURRENT ARC LAMPS.

WE HAVE IN STOCK THE FOLLOWING SIZES:

CORED CARBONS.

Diameter. Length.
 5-16 in. x 6 in., 6½ in., 7 in., 7½ in. and 8 in.
 3-8 in. x 7 in., 8 in., 9 in., 9½ in., 10 in. and 12 in.
 7-16 in. x 6 in., 7 in., 8 in., 9 in., 9½ in., 10 in. and 12 in.
 1-2 in. x 6 in., 7 in., 7½ in. and 8 in.
 5-8 in. x 12 in.

SOLID CARBONS.

Diameter. Length.
 7-16 in. x 7 in. and 10 in.
 1-2 in. x 6 in., 7½ in. and 12 in.

Having received a large consignment of these Carbons just before the new tariff went into effect, we are prepared to make very low prices. Send for price list.

CHICAGO EDISON COMPANY,

EDISON BUILDING, 139 ADAMS STREET, CHICAGO.

STEWART ELECTRICAL CO. CINCINNATI, O.

Write us for prices on anything in the following list or any other machinery wanted. This list comprises a few of our large stock.

Generators, 500 volt.

One T.-H. class 16, 40 k. w.
 Two Edison No. 20, 60 k. w.
 Four Edison No. 32, 100 k. w.
 Two T.-H. m-p., 75 k. w.

Dynamos.

Two 200 light, 16 c. p., 110 volt.
 One 100 light, 16 c. p., 110 volt.
 Two 2,000 c. p. T.-H. L. D. 2,
 35 light.
 One 2,000 c. p. Standard, 40 lt.
 One 3,000 c. p. Brush, 1 lt.
 One 10 ampere Wood, 3 lt.

The above are second-hand, in good condition.

FOR SALE QUICK, 34 street cars, both open and closed,
 equipped each with pair No. 6 Edison motors at \$200 per car.

Motors, 500 volt.

One ½ h. p. Keystone.
 One 1 h. p. T.-H.
 Two 7¼ h. p. T.-H.
 One 10 h. p. Eddy.
 One 25 h. p. Brush.
 One 50 h. p. T.-H.

Motors, 220 volt.

One ¼ h. p. Varwick.
 One ¾ h. p. Mather.
 One 10 h. p. Balf.
 One 15 h. p. Eddy.
 One 16 h. p. Edison.

EVERYBODY KNOWS STEWART.
 DEALERS IN & REPAIRERS OF ELECTRICAL MACHINERY

"A Terrible

BURN Vitogen

Covered two-thirds of body usual remedies failed very bad odor indication of blood poisoning. Applied Vitogen odor disappeared after second application wounds are entirely healed and patient discharged patient would have died of blood poisoning if it had not been for Vitogen. Case 897. Dr. Boyd."

See page 10 "Vitogen in Practice." Copy mailed free.

Sold by Druggists; 2 oz., 50c., 4 oz., \$1.00. Screw-cap bottles.
 Sent prepaid on receipt of price if your druggist hasn't it.

SOLE MFRS. The G. F. HARVEY CO., MANUFACTURING CHEMISTS, Saratoga Springs, N. Y.
 Canadian Branch, Mille Roches, Ont., KEZAR & BENNETT, Agts.

THE UNITED ELECTRIC IMPROVEMENT CO.

Office and Works: 19th and Allegheny Avenue,

PHILADELPHIA, PA.

MANUFACTURERS OF

Direct and Alternating Current Apparatus for Lighting
 and Transmission of Power.

High-Grade Incandescent Lamps FOR ANY SERVICE.

SEND FOR SAMPLES OF OUR NEW SERIES LAMPS.

VICTOR CIRCUIT BREAKER.

F. A. LA ROCHE & CO., 13th and Hudson Streets, NEW YORK.

Grimshaw White Core,

RAVEN WHITE CORE, RAVEN BLACK CORE, COMPETITION LINE WIRE, GRIMSHAW AND COMPETITION TAPES AND SPLICING COMPOUNDS.

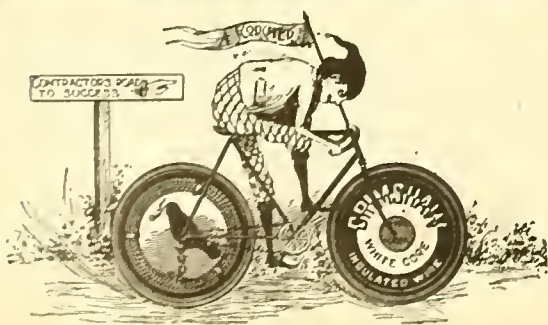
New York Insulated Wire Company,

MAIN OFFICE:
 13-17 Cortlandt St., New York.

BRANCHES: CHICAGO:
 320 Dearborn St.

BOSTON:
 134 Congress St.

SAN FRANCISCO:
 71 Flood Building.



Spring Complaints

Among telephone men are not so much in physical indisposition, but are mental worries.

Among telephone men are not so much in physical

What Are These Worries?

They are fears that shipments may be delayed, that goods may not be standard and that prices may be unduly advanced.

Our record in **TELEPHONE CONSTRUCTION MATERIAL** covers, From Stock,

Right Goods, Right Prices.

Central Electric Company,

264-266-268-270 Fifth Avenue, CHICAGO.



IMPERIAL

INCANDESCENT LAMPS—All Voltages and Candle Powers.

Our 220 volt lamps and 4 c. p. sign lamps are the best in the market. We guarantee an average life of 600 hours for our new 3-watt lamp.

CHAS. A. COOPER & CO., = 608 Roe Bldg., St. Louis, Mo.

Edison, Jr. Improved Incandescent Lamp.

Vacuum Highest Improved.
Concentrated Brilliant White Light.
Carbons Never Become Red.
Standard Candle Power.



No electrician who consults the interests of his patrons will use the old-fashioned kind since the advent of the EDISON, JR.

Although greatly superior, the prices of these Lamps have not been increased.

THOMAS A. EDISON, JR.,

General Offices and Salesrooms: 27 WILLIAM STREET, NEW YORK.

BOSTON OFFICE, 60 State Street.

ILLINOIS ELECTRIC CO., 239 Madison St., Chicago.

AUSTIN ELECTRICAL SUPPLY CO., Austin, Tex.

OLD DOMINION ELECTRIC CO., Norfolk, Va.

THOMPSON & CO., St. Paul, Minn.

OWEN BURNS, 405 Adams Bldg., San Francisco, Cal.

J. BOYD DEXTER, Annapolis, Md.

WM. GIBBS BAIN, 74B Drexel Bldg., Philadelphia.

BUCKEYE

INCANDESCENT LAMPS.

Monadnock Building, Chicago.

THE BUCKEYE ELECTRIC CO., Cleveland, Ohio.

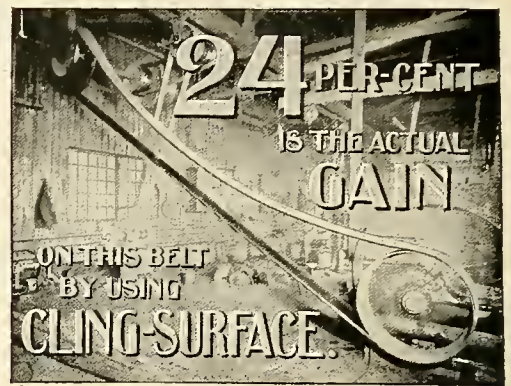
QUALITY
UNEQUALED.
FACTORY
PRODUCTION
TRIPLED.



If you have only ONE BELT that slips; is too tight; is oily or greasy; or carries too heavy a load, use

CLING-SURFACE

on it and the increased power ON THIS ONE BELT will pay for all the CLING-SURFACE required throughout the whole plant.



This little belt (12 in.) was our first slack belt - It earned \$640.00 in two years in increased power at a cost of only \$63.00 for CLING-SURFACE for the whole plant. Drop us a line and we will tell you the whole story.

CLING-SURFACE MFG. CO.,

177-182 Virginia Street, BUFFALO, N. Y.

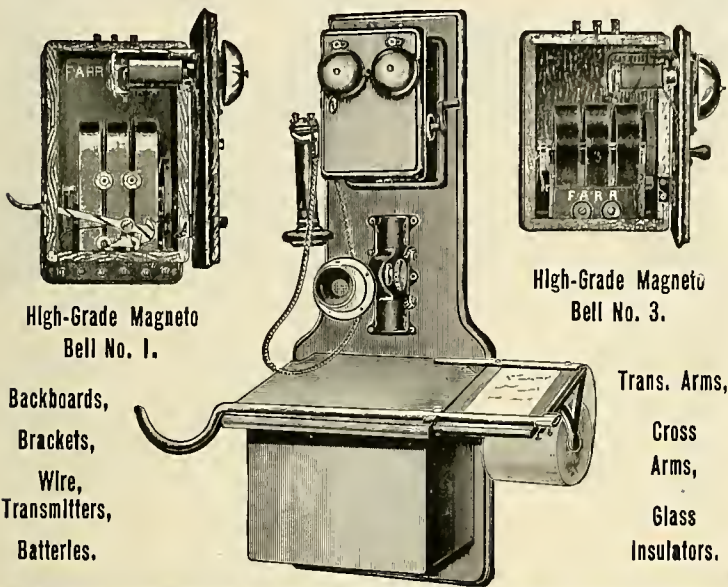
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Illinois Electric Co.
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Western Electric Co.
Western Elec. Supply Co.
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Huebel & Manger.
Illinois Electric Co.
Patrick, Carter & Wilkins.
Western Electric Co.
Western Elec. Supply Co.
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Cling-Surface Mfg. Co.
Crescent Chemical Co.
Leather Preserver Mfg. Corp.
- Belting.**
Leather Preserver Mfg. Corp.
Peerless Rubber Mfg. Co.
Shultz Belting Co.
- Billers.**
Westinghouse Machine Co.
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Electrician Publishing Co.
- Brushes.**
Central Electric Co.
Commercial El. Supply Co.
Holmes Fibre-Graphite Co.
Ohio Elec. Specialty Mfg. Co.
Western Elec. Supply Co.
- Burglar Alarms.**
Central Electric Co.
Commercial El. Supply Co.
Edwards & Co.
Electric Appliance Co.
Huebel & Manger, & Wilkins.
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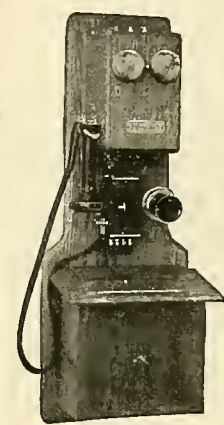
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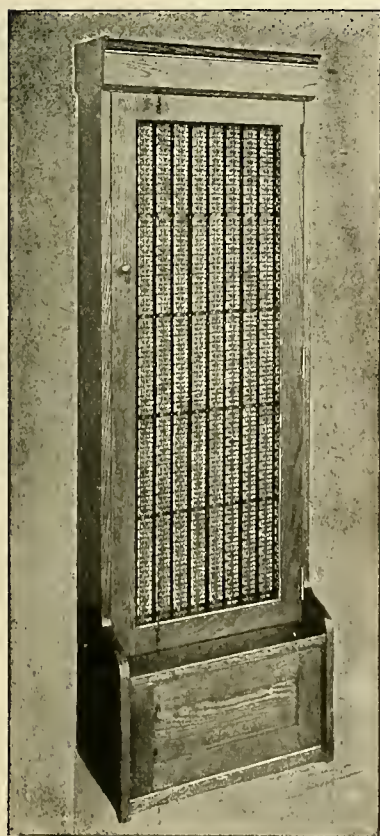
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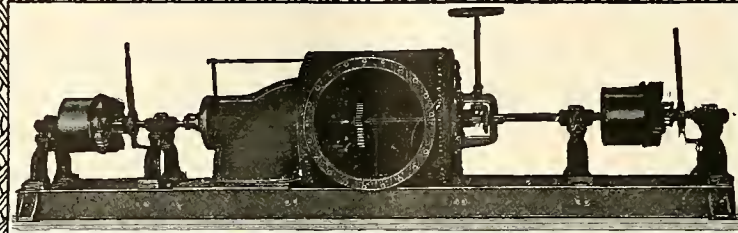
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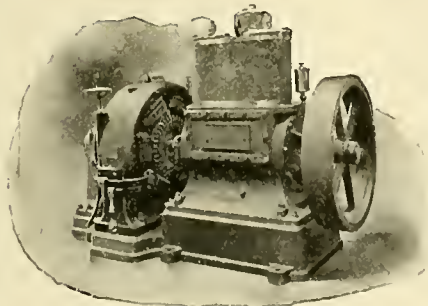
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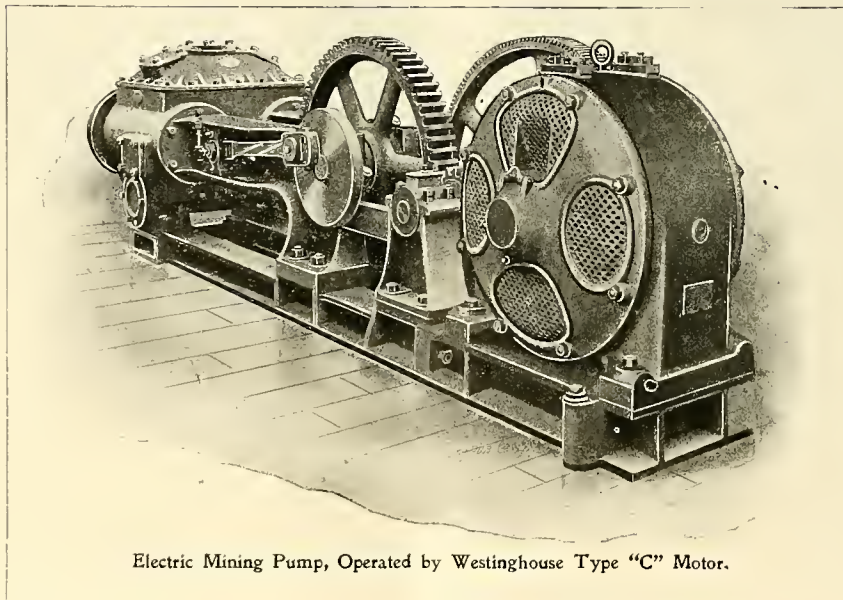
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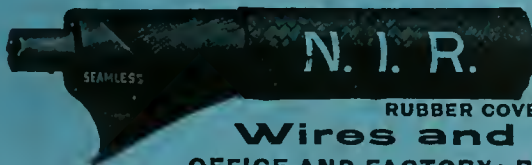
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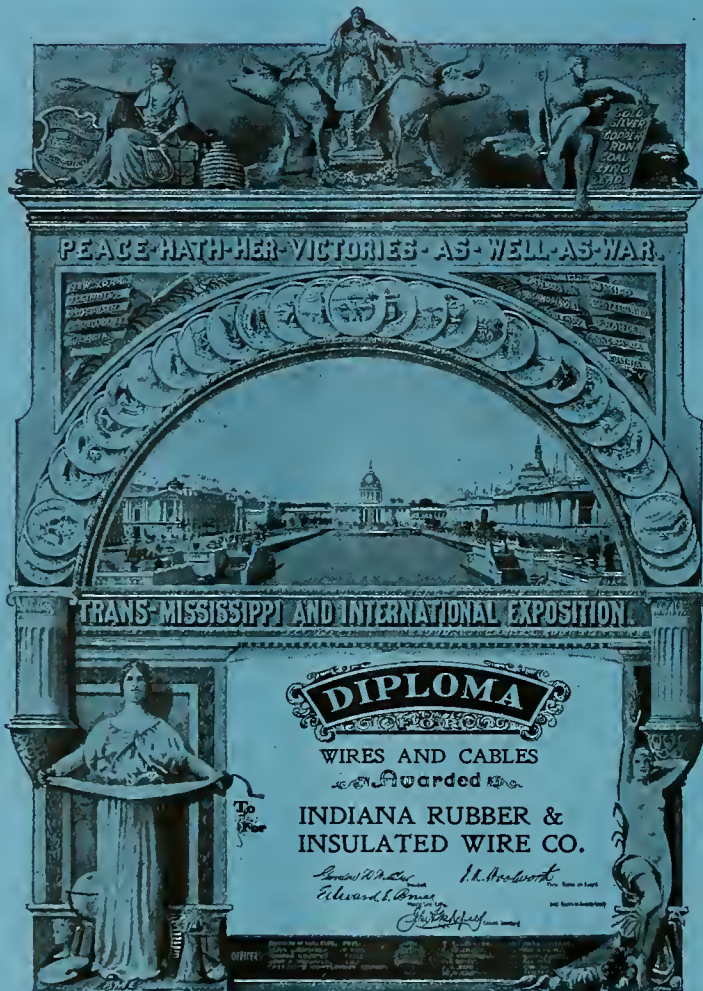


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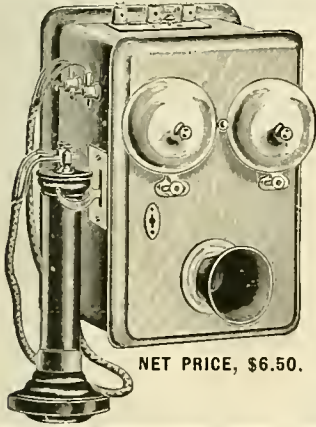
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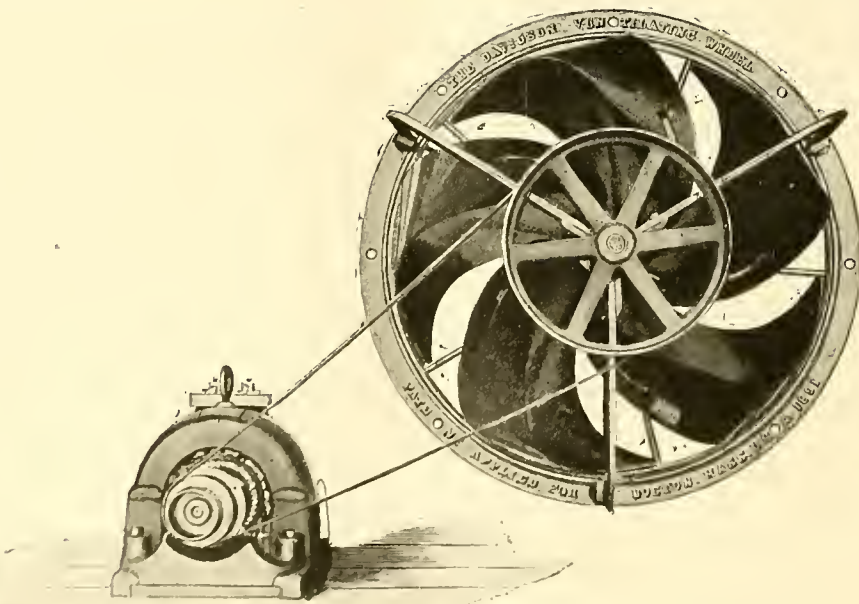
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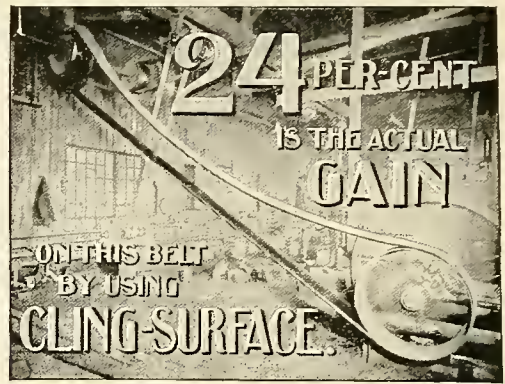
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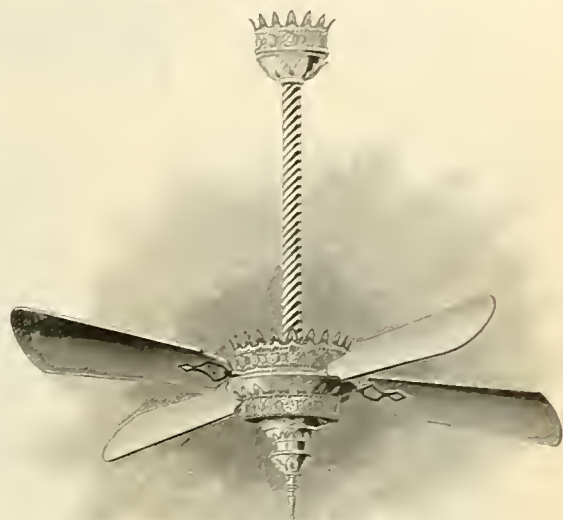
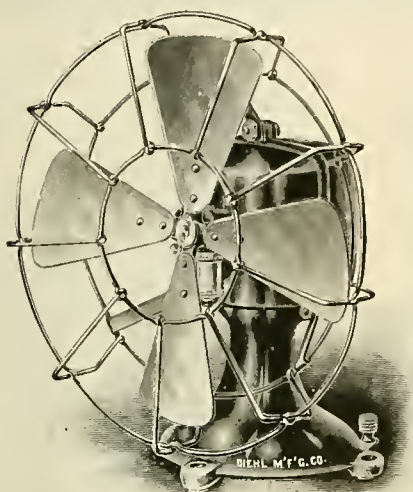
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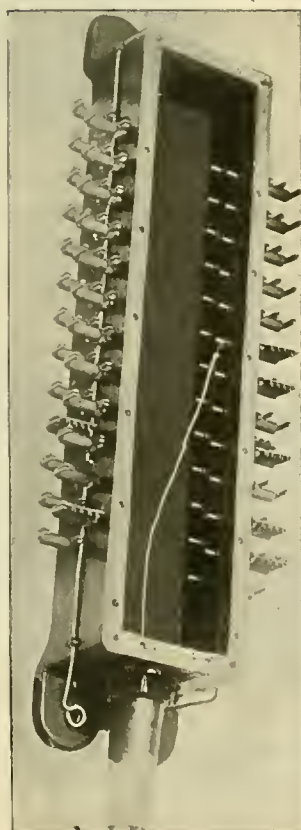
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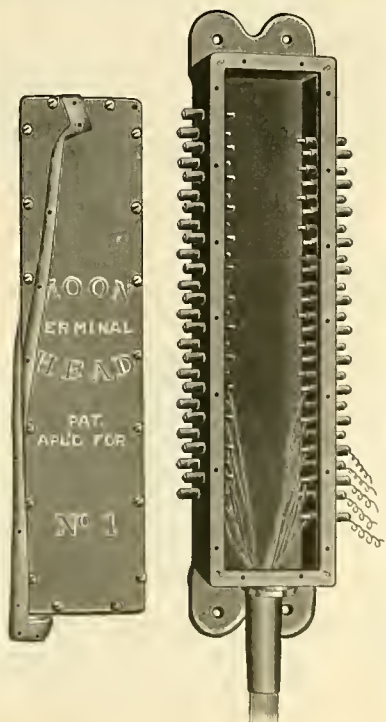
A PERFECT PROTECTION FOR

TELEPHONE CABLES.

THE MOON MFG. CO.,
45 S. Canal Street, CHICAGO.



Fuse Terminal.

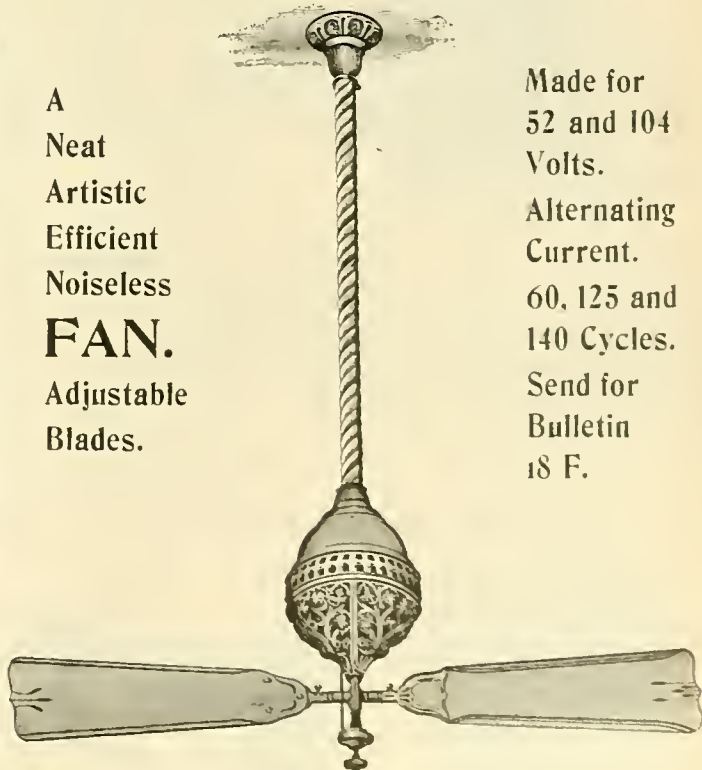


Plain Terminal.

AGENTS FOR THE TUERK FAN.

A
Neat
Artistic
Efficient
Noiseless
FAN.
Adjustable
Blades.

Made for
52 and 104
Volts.
Alternating
Current.
60, 125 and
140 Cycles.
Send for
Bulletin
18 F.



TUERK ALTERNATING CURRENT CEILING FAN.

WESTERN ELECTRIC COMPANY,
CHICAGO. NEW YORK.

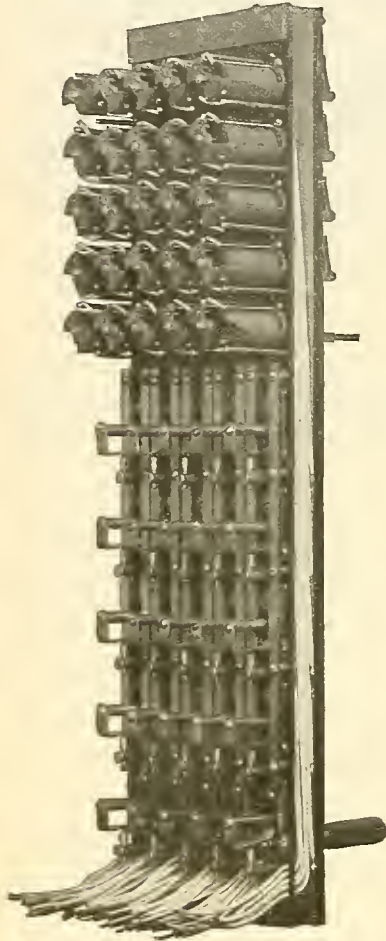
LONDON, E. C.,
70 Coleman St., and
North Woolwich, E.

ANTWERP,
33 Rue Boudewyns

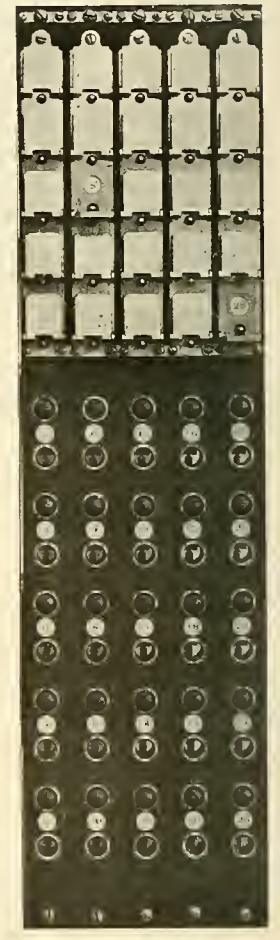
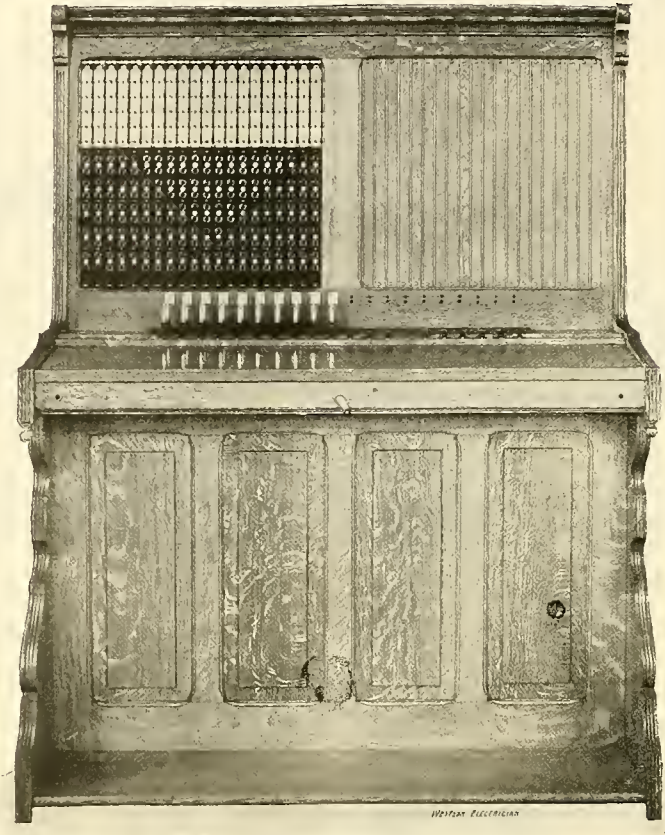
PARIS,
45 Avenue de Breteuil

The Most Reliable General Telephone VICTOR APPARATUS IS SCIENTIFICALLY

Back View of Five Five-drop Sections of Switchboard, showing Method of Invisible Wiring.



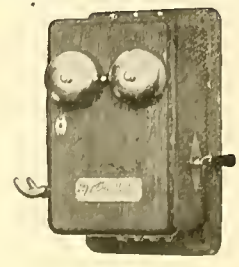
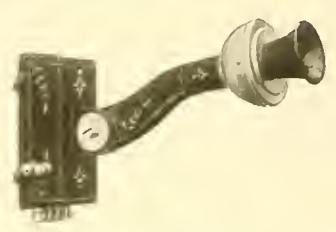
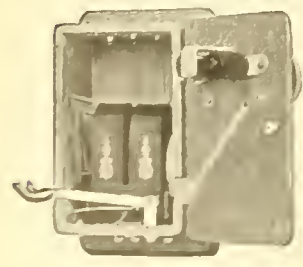
Front View of Same, showing Drops and Jacks. Additional Drops May be Purchased as Required.



THE VICTOR STRAIGHT
METALLIC SWITCHBOARD,
ADAPTED FOR EITHER CENTRAL ENERGY
OR ORDINARY MAGNETO CALLS.

THE EASIEST AND MOST ECONOMICAL BOARD TO MAINTAIN. THE ONLY SWITCHBOARD WHERE ALL CONNECTIONS ARE MADE ON HARD RUBBER. THE BEST BOARD ON THE MARKET FOR EXCHANGES, LARGE OR SMALL. INVISIBLE WIRING. THE EASIEST TO OPERATE. THE MOST POSITIVE AUTOMATIC SIGNALING CIRCUIT IN THE WORLD. Write for printed matter giving full information.

TELEPHONE PARTS, APPLIANCES AND EXCHANGE SUNDRIES.

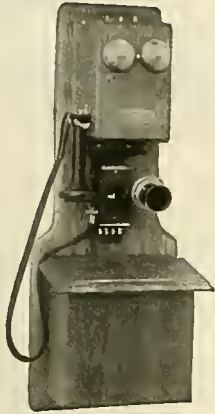


THE VICTOR TELEPHONE

166 TO 174 SOUTH CLINTON

Apparatus Manufacturers in the World

CORRECT AND MECHANICALLY PERFECT.



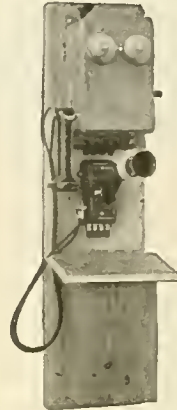
STYLE "C."

Our Leader and the Most Popular Exchange Telephone on the Market.



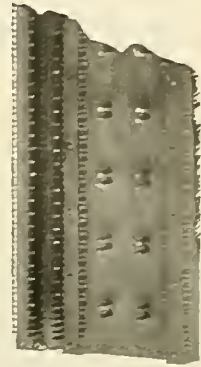
STYLE "K."

Long Distance Instrument.



STYLE "D."

Single Battery Box Phone.



VICTOR Ideal Combination Cross-Connecting and Fuse Board.

IMPORTANT

NOTICE TO EXCHANGE MANAGERS.

We wish to announce that we have recently added to our line of apparatus a complete **CENTRAL ENERGY SYSTEM**, overcoming many disadvantages heretofore encountered in systems of this class. **CHEAPEST TO INSTALL. CHEAPEST TO MAINTAIN. ALL POWER FOR SIGNALING AND TALKING SUPPLIED FROM CENTRAL STATION. SUPERVISORY SIGNALING. NO UNRELIABLE BATTERY SIGNALS. NO LISTENING IN ON PART OF OPERATOR NECESSARY. AUTOMATIC CLEAR-OUT DROP.** If you already have a straight metallic system **YOU CAN CHANGE** from your present magneto call to **CENTRAL ENERGY** without the least interruption, at a very slight cost.

Toll line boards may be placed immediately adjacent to central energy switchboard and same plugs used for either, or toll line switchboard may be incorporated in central energy board without change. **THIS SYSTEM HAS MANY OTHER ADVANTAGES THAT ARE PROFIT MAKERS. ALL VICTOR APPARATUS FULLY PROTECTED BY PATENTS. Write us.**

MANUFACTURING CO.,

STREET, CHICAGO, ILL., U. S. A.



THE GREAT TELEPHONE BATTERY



TRADE **GONDA** MARK

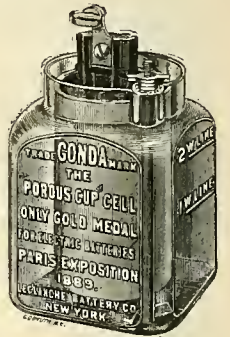
The Standard Open Circuit Batteries Of the World.

For more than a quarter of a century the GONDA TRADE MARK CELLS have stood at the head and been recognized as the model in all attempts at rivalry. In all that time the standard has never been lowered and the GONDA TRADE MARK CELLS have never been equaled. The reason is:

- FIRST.** The Exclusive Knowledge of the Only Way to Make Them.
- SECOND.** The Use of the Purest Materials Obtainable.
- THIRD.** The Exercise of the Utmost Care in Workmanship.



BEWARE OF IMITATIONS AND INFRINGEMENTS. THESE ONLY ARE GENUINE.



The Leclanché Battery Co.,

111 TO 117 E. 131ST STREET, NEW YORK.



THE HARRISON Primary Cell No. 1 Open Circuit Cell.

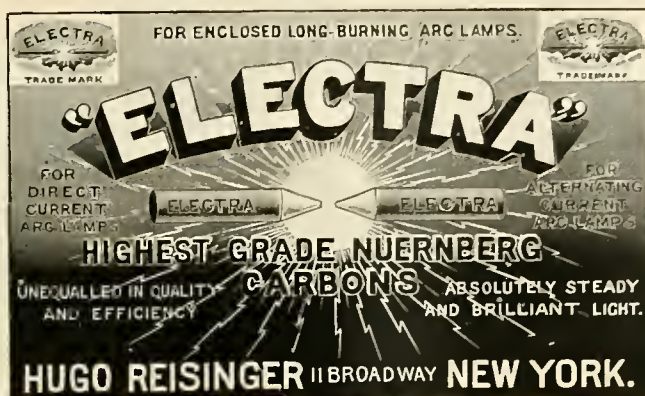
Positive Element: Zinc, Self-Amalgamating. No Local Action.
Negative Element: Lead Peroxide. No Carbon.
E. M. F., 2.45 Volts. Capacity: 40 Amp. Hours. No Creeping Salts.

Thermo Electric Co.,

SOLE AGENTS, TIMES BUILDING, NEW YORK.

The "ELECTRA" Highest Grade Nuernberg Carbons are recognized as standard all the world over.

All genuine "ELECTRA" carbons are put up in packages bearing the label with the trade mark "ELECTRA."



Good carbons mean less cost for current.

All the excellence in dynamos and arc lamps counts for but little where poor carbons are used in lamps.

LIGHTNING

and other high-tension currents cause more loss and annoyance to the Telephone Manager than any other item. We offer you a new device, guaranteed to automatically take care of all this trouble. An

AUTOMATIC LIGHTNING-ARRESTER

installed on your toll line, or in your exchange, will relieve the anxiety always felt by telephone people during severe lightning storms, and, as there are no fuses to burn out, your service will not be interrupted. This alone, in the course of a season, is worth ten times what it costs to install this arrester, for either instrument or switchboard. The magnets together with the nicked parts are mounted on polished hard rubber. Fiber or porcelain base.

Write for prices and additional information.

BUTLER-TAYLOR COMPANY, RAVENNA, OHIO.

"An ounce of prevention is worth a pound of cure."

"DURO"

- Telephone Cords . . .
- Switchboard Cords . .
- Medical Battery Cords.

THE ONLY practical method yet devised to tip a Flexible Conductor using the full strength of the covering is that employed in the

"Duro" Telephone Cord



ALL other devices fail to hold, but that hook is positive! The Conductor, Shell and Pin are all soldered together and therefore cannot come apart. Why not use the Best?

MANUFACTURED BY
CHARLES H. McEVROY,
LOWELL, MASS.



WOOD'S MOTO-VEHICLES.

THE WOOD ELECTRIC MOTO-VEHICLES.

SEND FOR "SPECIALLY FINE" CATALOGUE.

AMONG OTHER THINGS WE GUARANTEE ARE:

- That the material and workmanship in the vehicle shall be of the very best, including rubber tires and ball bearing axles.
- That for a period of one year the Company will replace, free of charge, any broken parts due to defective material or faulty shop construction.
- That the vehicle shall have, on a level hard roadway, a mileage capacity in one charge of the batteries that will carry its given load twenty-five miles at an average speed of twelve and one-half miles per hour, two hours.
- That the batteries can be charged when fully discharged in two and one-half hours' time.
- That the vehicle shall be capable of climbing a six per cent. grade with given load when batteries are reasonably well charged.
- That for the sum of \$50.00 per annum, the Company will furnish all parts for keeping batteries in perfect repairs for a period of five (5) years, leaving them at the end of the five years in good condition for operation during the ensuing year.

AVERAGE COST TO RUN PER MILE, 3-4 CENT.

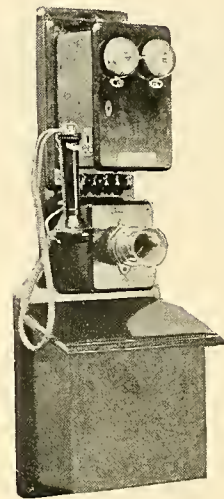
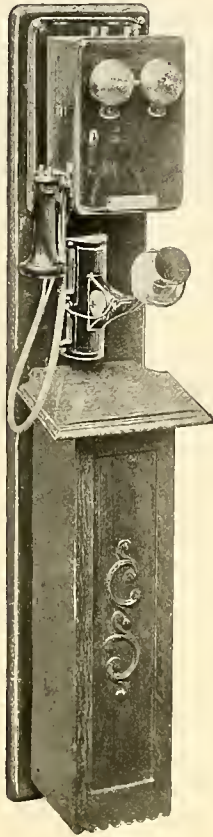
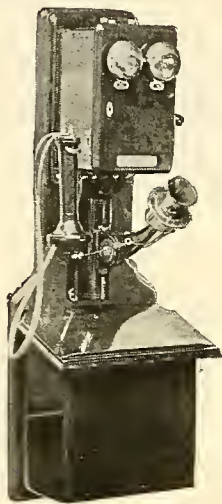
FISCHER EQUIPMENT CO.,

110-112 EAST TWENTIETH STREET, CHICAGO, ILL., U. S. A.

Western Electrical Supply Co.

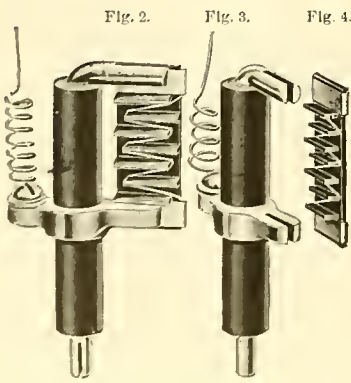
St. Louis,

Missouri.



Telephones and All Accessories.

Terminal and Distributing Boxes.

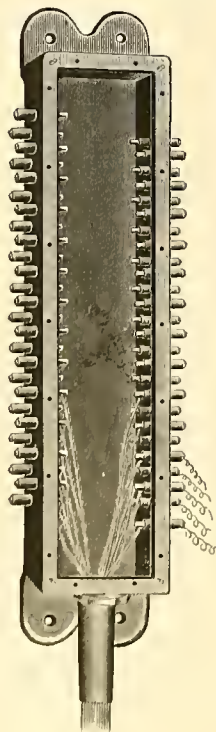


Fuses for Fused Cable Box.

Fig. 2. Shows fuse block in position.

Fig. 3. Shows terminal separated from iron case and without fuse.

Fig. 4. Shows fuse block separated from terminal.



Plain Cable Box.

Telephone Line Material and General Telephone Supplies of Every Description.

"SAFETY"

Telephone Wire and Cable.

INSIDE WIRE.

B. & S.	Approximate Decimals.	RUBBER INSULATION.	
20	.032	$\frac{3}{8}$ "	Plain, without Braid, Single Conductor.
"	"	"	" " " Twisted in Pairs.
"	"	"	Braided, Single Conductor.
"	"	"	" " " Twisted in Pairs.
19	.036	$\frac{3}{8}$ "	Plain, without Braid, Single Conductor.
"	"	"	" " " Twisted in Pairs.
"	"	"	Braided, Single Conductor.
"	"	"	" " " Twisted in Pairs.
18	.040	$\frac{4}{8}$ "	Plain, without Braid, Single Conductor.
"	"	"	" " " Twisted in Pairs.
"	"	"	Braided, Single Conductor.
"	"	"	" " " Twisted in Pairs.

OUTSIDE WIRE.

B. & S.	Approximate Decimals.	RUBBER INSULATION.	
16	.051	$\frac{5}{8}$ "	Plain, without Braid, Single Conductor.
"	"	"	" " " Twisted in Pairs.
"	"	"	Braided, Single Conductor.
"	"	"	" " " Twisted in Pairs.
16 B. W. G. Hard Drawn Copper,	.065	$\frac{5}{8}$ "	Braided, Single Conductor.
" " " " " "	"	"	" " " Twisted in Pairs.
" " " " " "	"	$\frac{6}{8}$ "	" " " Single Conductor.
" " " " " "	"	"	" " " Twisted in Pairs.
14	.064	$\frac{6}{8}$ "	Plain, without Braid, Single Conductor.
"	"	"	" " " Twisted in Pairs.
"	"	"	Braided, Single Conductor.
"	"	"	" " " Twisted in Pairs.

AERIAL TELEPHONE CABLES.

B. & S.	Approximate Decimals.	RUBBER INSULATION.	
18	.040	$\frac{4}{8}$ "	Taped and Braided.

Aerial Cables from 2 to 51 Pairs.

Underground RUBBER-COVERED Lead-Encased Telephone Cables in any number of pairs desired.

"SAFETY" SUBMARINE CABLE FOR TELEPHONE USE IS A STANDARD.

WE REFER TO ALL THE LEADING BELL TELEPHONE COMPANIES OF AMERICA.

Prices Furnished on Application.

THE SAFETY INSULATED WIRE & CABLE CO.,

225 to 239 West 28th Street, NEW YORK.

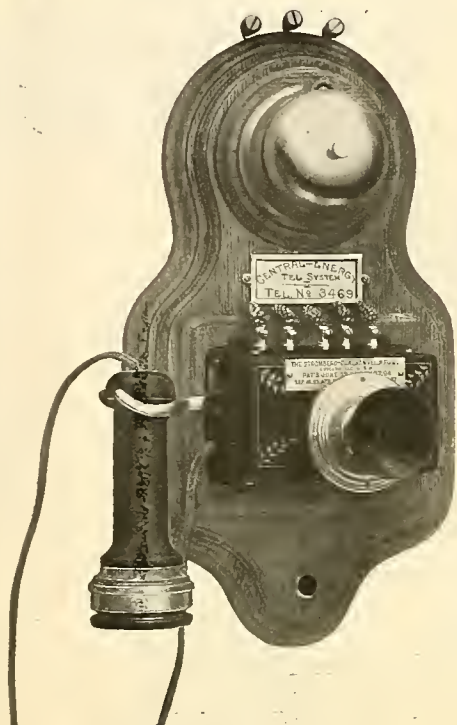
M. B. AUSTIN, Monadnock Block, CHICAGO.

GOL. E. J. SPENCER, Security Bldg., ST. LOUIS.

LEONARDO F. REQUA, General Manager.

A NEW THING. Central Energy Telephone System.

THE SYSTEM OF THE FUTURE.



All parts subject to deterioration and wear placed at central office, leaving nothing at subscriber's station requiring attention, reducing cost of maintenance to practically nothing.

The Only System

Of its kind on the market. Our transmitter and receivers not being affected by the greatest variations in temperature or atmospheric changes, and being locked to prevent opening by inexperienced persons, leave no possible cause for readjustment; and are the only ones that can be used satisfactorily on central energy systems.



Users of our regular Equipment can readily change to "The System of the Future."

SWITCH

(DIVIDED)

Rapid to Operate.

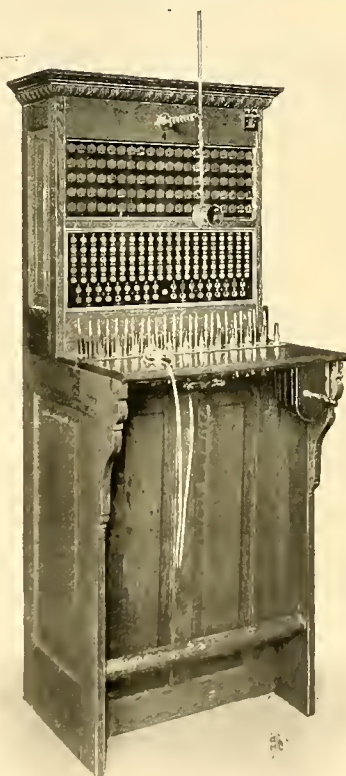
**SIMPLE,
DURABLE,
RELIABLE,**

Every detail part made strong and durable.

All connections soldered.

Impossible for subscribers being cut out.

NON-INFRINGING.



100 DROP SECTION SWITCHBOARD.
Trunking capacity for 1000 wire exchange.

BOARDS

(MULTIPLE)

For any size Exchange.

Any one operator completes connection
Between Any Subscribers.

The only reliable board for large exchanges, modernly equipped, on the market.

FULLY GUARANTEED.

Toll Line Apparatus A Specialty. All Goods Sold Direct. Do Not Take Imitations and Infringements.

The STROMBERG-CARLSON TELEPHONE MFG. CO.

70-82 W. JACKSON BOULEVARD, CHICAGO, U. S. A.

GREAT REDUCTION IN PRICE.

Ward Leonard Rheostats.

Best.
Handsomest.
Cheapest.



3 H. P. SIZE.

Sample will be sent upon approval to any user in any part of the world.

Write for Complete Price List and Discounts.

**WARD LEONARD ELECTRIC CO.,
BRONXVILLE, N. Y.**

**Motor Starters
with
Automatic Release.**

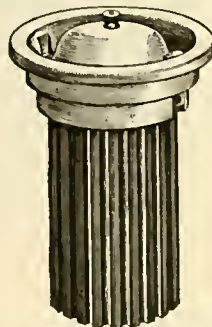
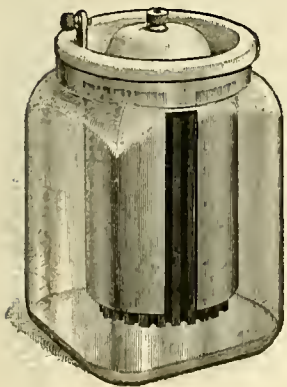
H. P. of Motor.	Volts.	Catalogue No.	Price.	Code-Word.
1/2	125	NU 14	4.50	Vaolah
	250	NU 22	4.50	Vascones
	500	NU 51	4.50	Vedius
1	125	NU 18	4.50	Vandalla
	250	NU 24	4.50	Vasilipot
	500	NU 52	4.50	Vegetus
2	125	NU 116	4.50	Vanglonas
	250	NU 28	4.50	Vat canus
	500	NU 54	4.50	Veglia
3	125	NU 124	4.50	Vaonlus
	250	NU 212	4.50	Vatinius
	500	NU 56	4.50	Velentes
5	125	NU 140	7.50	Varapes
	250	NU 220	7.50	Vatropus
	500	NU 510	7.50	Vejeris
7 1/2	125	NU 160	8.40	Vardael
	250	NU 230	8.40	Vaocluse
	500	NU 515	8.40	Velabrum
10	125	NU 180	8.70	Variabra
	250	NU 240	8.70	Vauconleus
	500	NU 520	8.70	Velantus
15	125	NU 1120	19.20	Vashnl
	250	NU 260	14.40	Vechires
	500	NU 530	14.40	Veieida
20	125	NU 1150	10.80	Vasatae
	250	NU 215	15.30	Vectlus
	500	NU 538	15.00	Vella
25	125	NU 1100	27.60	Vasarhely
	250	NU 295	27.40	Vecton's
	500	NU 548	15.60	Vellbrin
30	125	NU 1230	36.00	Vettus
	250	NU 2115	30.00	Vatilonla
	500	NU 558	27.00	Veturia
40	125	NU 1288	36.00	Vellnum
	250	NU 2144	30.00	Vellocassi
	500	NU 572	27.00	Vellterna
50	125	NU 1360	42.00	Vladrus
	250	NU 2180	36.00	Vialis
	500	NU 590	30.00	Via'ma

Prices on larger sizes upon application.

THE HERCULES BATTERY.

The Acme of Perfection.

In placing the Hercules on the market, it has been our aim to produce a high-grade battery at a moderate cost, and we feel confident that all users will agree that our object has been accomplished.



The Hercules consists of a fluted cylinder, made of selected carbon, filled with a depolarizing compound.



The zinc is cylindrical in form and made of the best rolled zinc and thoroughly amalgamated.

The cover is of porcelain and forms a perfect lid for the jar and prevents evaporation or the climbing of salts.

We can cheerfully recommend the Hercules as being one of the best batteries on the market, and is without an equal for gas lighting and gas engine work, and, in fact, for all open circuit work, where the conditions are most severe.

E. M. F., 1.47 Volts. Internal Resistance, .11 Ohms, and Current on Short Circuit about 13.4 Amperes.

PERU ELECTRIC MFG. CO., - PERU, IND.

TO

Independent Telephone Exchanges, Electricians

AND GENERAL ELECTRICAL DEALERS:

REASONS WHY WE CAN SELL GOOD GOODS CHEAP:

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. No High Salaried Officers. 2. Discount Our Bills. 3. Manufacture From Raw Material. 4. Employ No Traveling Agents. 5. Make No Expensive Catalogues. | <ol style="list-style-type: none"> 6. Low Insurance Fireproof Building. 7. Make No Bad Accounts. 8. Low Rents. 9. Buy In Large Quantities. 10. Close Attention To Business. |
|--|--|

MORE THAN 800 INDEPENDENT TELEPHONE EXCHANGES IN UNITED STATES AND CANADA BUY ALL THEIR TELEPHONES AND SUPPLIES FROM US.



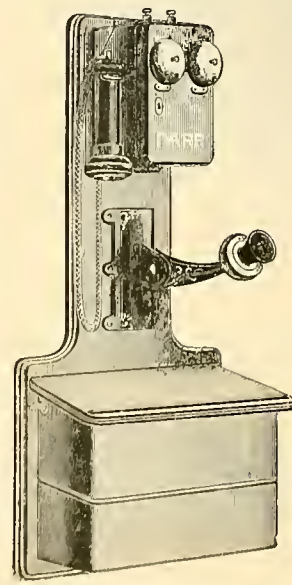
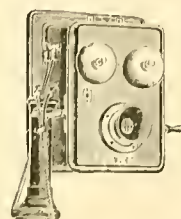
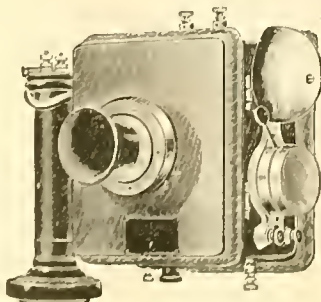
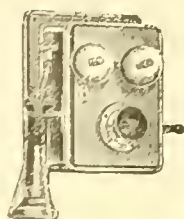
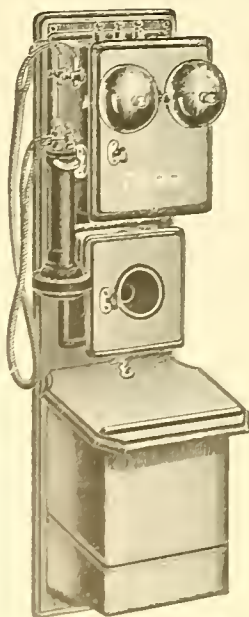
OFFICE AND SALESROOM.

Farr Telephone and Construction Supply Company,

357 DEARBORN ST., CHICAGO,

WHOLESALE AND RETAIL DEALERS AND MANUFACTURERS OF

Bridging Telephones, Series Telephones, Exchange Telephones, Interior Telephones, Desk Telephones, Transmitters, Receivers, Brackets, Glass Insulators, Iron Wire, Copper Wire, Annunciator Wire, Batteries, Backboards, Hooks. Everything in Supply Line. 10,000 High-Grade Magneto Bells. Send for Catalogue.



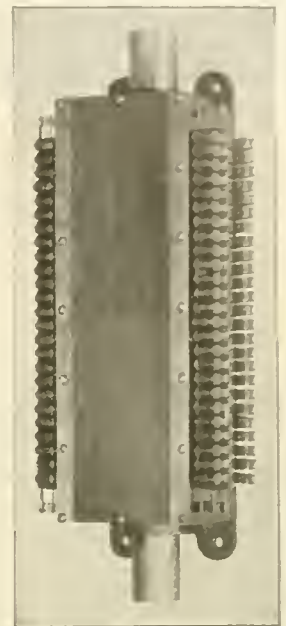
Telephone Appliances

SIMILAR TO

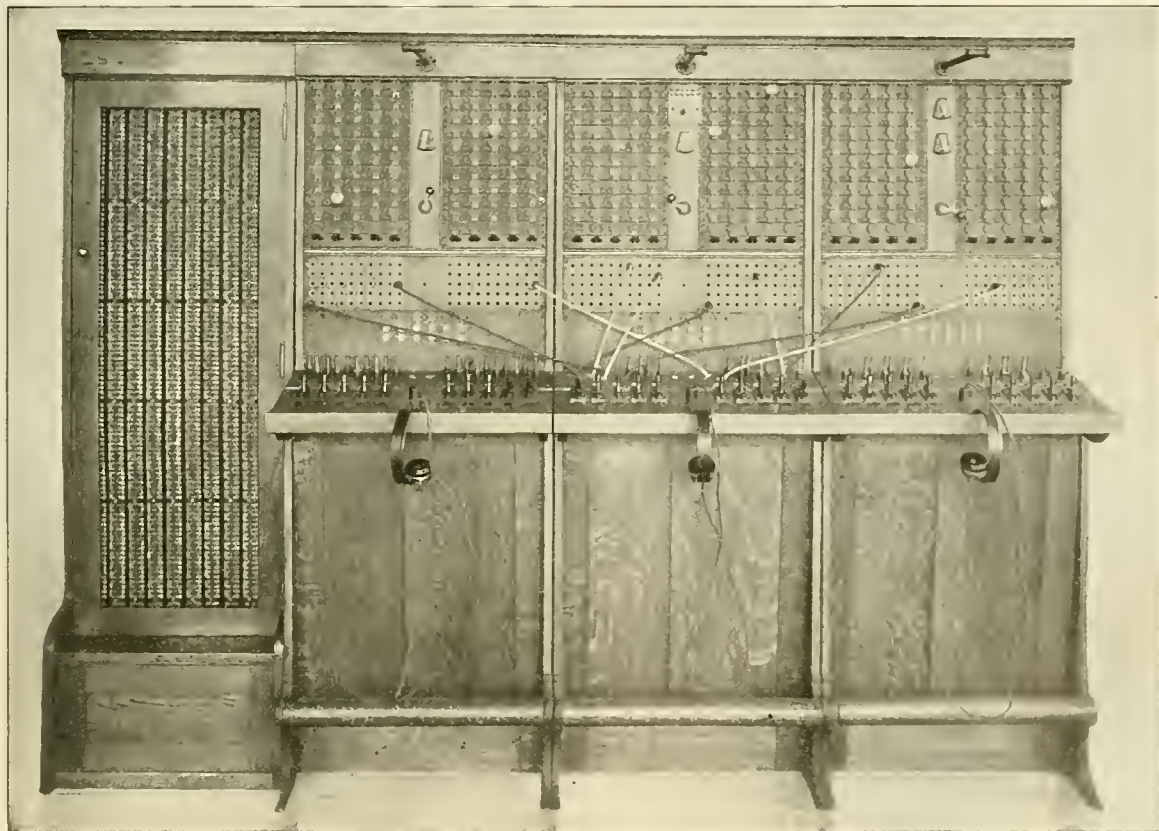
BELL APPARATUS

FOR

Independent Telephone Companies.



Combined Cable Terminal and Complete Protector of 25 Metallic Circuit Capacity.



300 Drop Sterling Metallic Circuit Board Showing the Distributing Board at the Left.



Pole Top Cable Terminal.

Sterling Electric Co.,

71 AND 73 W. ADAMS STREET,

CHICAGO, ILL.

WHITE CEDAR POLES

THE VALENTINE-CLARK CO., CHICAGO, ILLINOIS.

Yards: Green Bay, Wisconsin; New London, Wisconsin; Prentice, Wisconsin; Pinconning, Michigan.



**SOMETHING NEW...
...OUR LOCATION.**

**BETTER FACILITIES. NEW MACHINERY.
MORE ROOM.**

We make Switchboards, Resistance Boxes, Wheatstone Bridge, Telephone Parts, Extension Bells, Repeating Coils, Induction Coils, Special Coils, Transmitters, Receivers, Demagnetizers, Transformers, Head Bands, Cigar Lighters, Medical Coils, Punches and Dies, Etc.

We do Punching, Screw and Milling Machine Work, Metal and Fibre Sawing, Etc. Repair work promptly attended to.

Magnets of all kinds; Our winding department in charge of an expert. If unable to get what you want, write us, we are ready to furnish it on short notice.

HOLYOKE & HOLYOKE,

S. E. Cor. Van Buren and Clinton Sts.,

...CHICAGO, ILL.

NEW DESIGNS

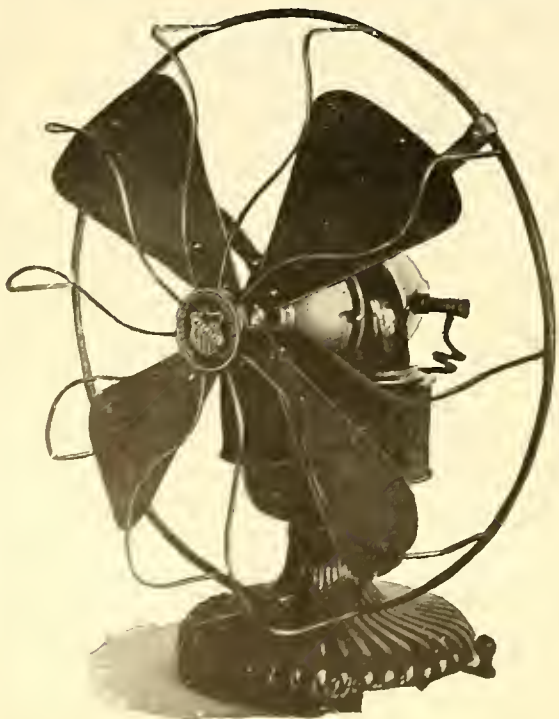
BATES ELECTRIC FANS

Wound for any Voltage
Direct or Alternating

For Ceiling or Desk
A Written Guarantee with each Fan.

D.L. BATES & BRO.
DAYTON, O.

A NEW FAN MOTOR, PEERLESS.



IT'S a beauty and guaranteed 20 per cent. more efficient than any on the market. Think of a 12-inch fan running 1,850 revolutions per minute with only 35 watts. Price is right also. Agencies wanted.

**THE WARREN ELECTRIC
AND SPECIALTY CO.,
WARREN, OHIO,**

MANUFACTURERS OF PEERLESS { INCANDESCENT LAMPS, FAN MOTORS, TRANSFORMERS.

THE STANDARD TELEPHONE COMPANY'S OFFICERS AND CUSTOMERS TAKE A DAY OFF.

THE RESULT

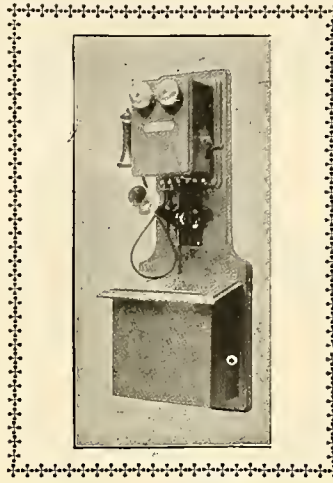


The opportunity to buy first-class Telephone Apparatus at Madison is equally as good as the fishing. A trial order will convince you.

WE CALL ATTENTION TO
 Our New Duplex Switchboard,
 Our New Magneto Generator,
 Our New Cut-Out and Fuse Arrester,
 Our New Desk Portable,
 Our New Standard Dry Battery.

STANDARD
TELEPHONE AND ELECTRIC CO.,
MADISON, WIS.

The Newest!
And Finest!



The Greatest!
Long Distance

READY FOR SHIPMENT MARCH 15, 1899.

TELEPHONE OF THE WORLD.

Concealed or Outside Binding Posts.

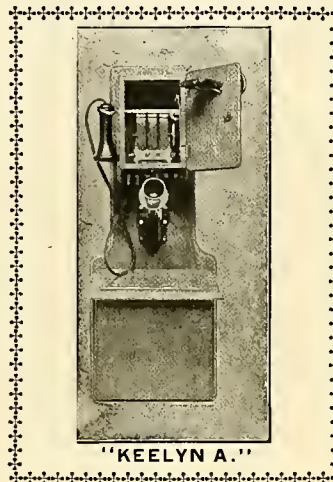
Most powerful magneto-generator and bell in the market.

Bi-polar receivers; highest grade. The embodiment of simplicity.

Perfect mechanism; platinum points.

Cast-transmitter caps, (solid).

Cast-transmitter backs, (solid).



For Exchanges—Series No. 1.
Bridged No. 2 for Toll Lines.
Challenges admiration!
Surpasses competition!!
Value unequalled!!!
The grandest telephone ever produced!!!!
Try it.
Order a sample.

The Success of Independent Telephony is Encompassed in These Six Points:

Knowledge of the Art; x x **C**omprehension of its Science **S**
Energy in its Business Development; In the face of Tyranny **Y**
Earnestness in Providing Protection; x x **C**are of Patron **S**
Liberality of Resources; x x x x x x x **W**ithout Limit **T**
Yankeeism in Application and Execution; Beyond Measure **E**
Novelty of Invention and Production; x x x **A**d Libitum **M**

This is the SIXTH YEAR of our incorporation. Each year some mushroom competitor has circulated false stories about us. The files of this paper during these six years will prove that we have survived hundreds of "busted" or "sold-out" competitors; many of them more pretentious and denunciatory than those who villified us last year, or may attempt to this year. It is a safe statement that if the KEELYN SYSTEM had not been able to uphold INDEPENDENT TELEPHONY AND ITSELF, none of its competitors would have survived.

Again for the Sixth Annual time let us remind the public that SIX YEARS HENCE the KEELYN SYSTEM will still be LEADING TO SUCCESS! Notwithstanding that patent pirates and combinations of guerillas who purloin its rights and attempt the theft of its fair name may then be relics of the past. Trade with the most reliable and largest telephone factory in America.

Western Telephone

Note.—Largest Manufacturers of Telephones in the World.

250 So. CLINTON

THE SWITCHBOARD OF A TELEPHONE EXCHANGE

IS LIKE UNTO THE DYNAMO OF AN
ELECTRIC LIGHT PLANT.

IF THE SWITCHBOARD WORKS POORLY THE
TELEPHONES WORK POORLY.



Experienced electric light men will tell you to shun poor, cheap and untried dynamos, although the market is full of them.

Experienced and honest telephone men will advise you to purchase the "highest priced" as the only means of getting satisfaction. If a switchboard is properly built, it cannot be "low priced" in first cost, but is **CHEAPEST AND NECESSARY** in the end.

DON'T BE MISLED!

WRITE TO USERS!

**Why Does the "Western" Succeed?
Why Are its Competitors so Jealous?**

SIMPLY BECAUSE:

- 1st. It is far in advance of all others.
- 2nd. It has kept up-to-date—others have copied from it.
- 3rd. It operates under its own patents; others have found it expedient to pirate its patents—it has several suits in the courts against a number of its competitors.
- 4th. It has succeeded in winning every patent suit it has been engaged in—which has thus far been decided—a large number of them, too.
- 5th. It employs its own patent attorneys and keeps its own patent experts—therefore it is in a position of reasonable certainty, always.
- 6th. Its competitors cannot keep pace with it—they resort to slander and falsehood, which sooner or later prove boomerangs to them.
- 7th. It is honest and fair in its dealings.
- 8th. It, alone, manufactures in its own factory all of its telephones and switchboards.
- 9th. It has the only complete independent telephone engineering department in America.
- 10th. It has the only complete and extensive library of telephone patents outside of the United States government control—a feature absolutely essential to a safe conduct of the telephone manufacturing business.
- 11th. Its officials are the most experienced and progressive men in the business.
- 12th. It has control of over 100 patents upon telephone devices.
- 13th. It produces high-class telephone apparatus of all kinds.
- 14th. It fulfills its agreements.
- 15th. It helps its customers toward success.
- 16th. It has replaced over 10,000 other makes of telephones and has thousands of testimonials of its good results.
- 17th. It manufactures more telephone apparatus than any independent concern in America.
- 18th. It has been manufacturing telephones longer than any independent concern in America.
- 19th. It has been the only concern to successfully litigate against Bell patents.

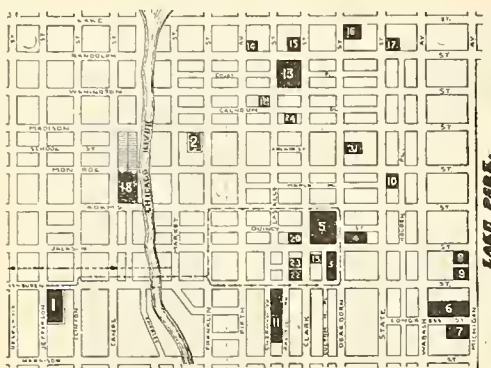


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Construction Co.,

STREET, CHICAGO.

The Largest Makers and Dealers
in Switchboards in America.



COME AND SEE US

and investigate our unequalled facilities for handling your Electrical Supply business in our new building.

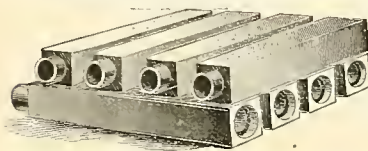
Electric Appliance Company,

92-94 W. Van Buren St., CHICAGO.

America's Largest Electrical Supply House

Take cable cars anywhere on cable loop shown on above map.

- | | | |
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| No. 2 Old " | No. 10 Palmer House | No. 18 Union Depot |
| No. 3 Monrovia | No. 11 Rock Island Depot | No. 19 Grand Hotel |
| No. 4 Great Northern | No. 12 State Exchange | No. 20 Grand Palace Hotel |
| No. 5 Post Office | No. 13 Court House | No. 21 Seaside |
| No. 6 Auditorium | No. 14 Congress Hotel | No. 22 McCook |
| No. 7 Ames | No. 15 Superior Hotel | No. 23 Wisconsin Business Hotel |
| No. 8 Leaning Tower | No. 16 Terminal | No. 24 Beachor |
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TAKE METROPOLITAN TRAINS ANYWHERE ON THE LOOP.
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Also Poles and Cross-Arms.

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THERE ARE MORE

C.-H. RHEOSTATS

IN USE THAN ALL OTHER MAKES COMBINED.

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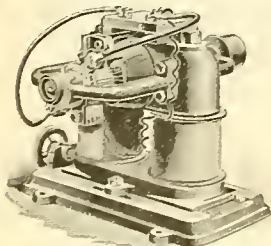
The Largest Manufacturers of Rheostats in the World.

Our NEW IMPROVED BATTERY keeps the

American Electric Vehicle Co.

IN THE LEAD—PIONEERS ALWAYS

Send for Catalogue of Carriages
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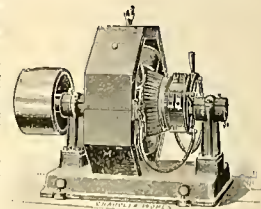


KESTER TWO-POLE MEDIUM SPEED MOTORS

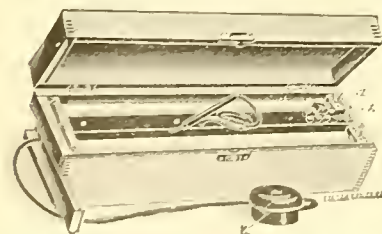
Were first placed on the market in 1889, and at that early day they never failed to demonstrate in actual service that for efficiency, durability and "ever-readiness" they were in a class by themselves. To day thousands of pleased customers would say that Kester Two-Pole Motors represent all that is best in correctness of design and ease of operation. In appearance they give one a most favorable impression, but it is in the actual "sawing of the wood" where their superiority asserts itself.

For those who desire a motor of 7½ horse power or over we cannot too highly recommend our Four-Pole Type. These motors have ventilated armatures form-wound non-overlapping coils and carbon brushes. They are constructed to be operated for continuous runs of any duration. There is no annoyance from heating, no sparking, and the brushes or any part of the motor requires no attention under any change of load.

Two-Pole Motors, ½ to 10 h. p. Multipolar Motors, 7½ to 100 h. p.



KESTER ELECTRIC CO., TERRE HAUTE, INDIANA, U. S. A.



The Direct Reading Ohmmeter

WILL ACCURATELY MEASURE RESISTANCE ON A RAPIDLY MOVING ELECTRIC CAR.

No other instrument can meet such difficulties of stray magnetism and vibration. A boy can use it. The brains are in the box.

The American Electric Specialty Co.,
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STOP VALVE PACKING

LEAVES THE STEM CLEAN.

Write for testimonials. Manufactured exclusively by

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Incandescent Lamps.

High Efficiency, Long Life, Sustained Candle Power.

Dynamos, Motors, Arc Lamps, Switches, Motor Controllers, Enclosed Fuses and Other Electrical Appliances.

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Armatures to Rewind, Commutators to refill, Dynamos and Motors to rebuild.

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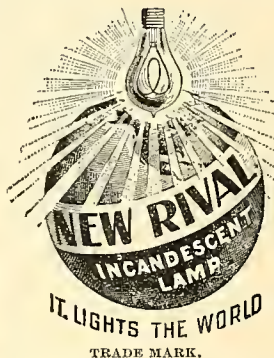
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For Arc Light and Trolley Cord.



WATERPROOFED.

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EXTREME BRILLIANCY,
GREATEST DURABILITY
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Apparatus for

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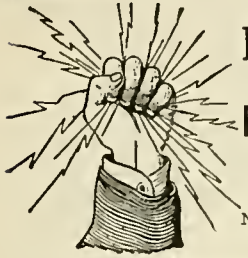
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INCANDESCENT AND FLEXIBLE CORDS,
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**AMERICANITE, MAGNET, OFFICE AND
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MONTREAL BRANCH, Eugene F. Phillips' Electrical Works.

MAIN OFFICES AND FACTORIES, PHILLIPSDALE, R. I.

THE "CLARK" WIRE.

FOR
SWITCHBOARD
RAILWAY
and MOTOR USE.



All sizes of
Stranded and Flex-
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Cables with
Clark's Insulation

Inspector Boston Fire Underwriters' Union says:

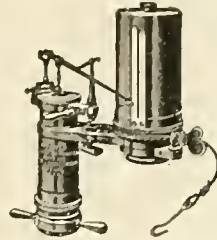
"A thoroughly reliable and desirable wire in every respect."

The Clark wire has been before the public and in use for the past ten years, and has met with universal favor. We guarantee our insulation wherever used, Aerial, Underground or Submarine, and our net prices are as low, if not lower, than any other first-class insulated wire. We shall be pleased to mail Catalogues, with terms and discounts for quantities.

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VICTOR CIRCUIT BREAKER.

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This question is answered in our FREE illustrated book, entitled: "CAN I BECOME AN ELECTRICAL ENGINEER?" Address

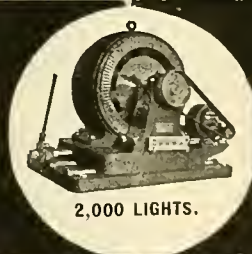
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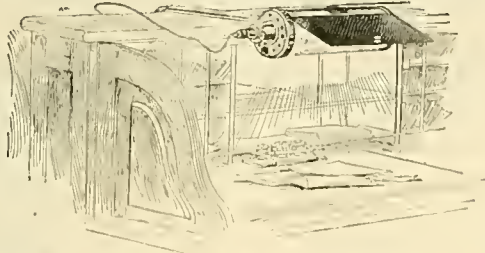
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SAVE YOUR EYES BY USING



The KINSMAN DESK LAMP

Which is the only fixture made which will properly light a roll-top desk and at the same time shield the eyes. Beware of the numerous cheap imitations in the market.

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- The Bradford Belting Co., Cincinnati

Phillips Insulated Wire Co.,

Office and Factory: PAWTUCKET, R. I.

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We are unable to supply the demands made upon us for good technical men. We especially need all draughtsmen, civil, mechanical and electrical engineers and salesmen. If you are out of a position or want a better one, write us. We refer you to the Western Electrician as to our reliability.

THE TECHNICAL AGENCY,

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In every state in the Union who visit manufacturers of dynamos and motors, electrical street railways, electrical repair shops, electrical supply jobbers, to take our line of insulation on commission. Good live salesmen can add \$1,200 to \$1,500 per year to their incomes. All necessary samples can be carried in pocket. W. H. SILL'S MICA CO., 60, 62, 64 Michigan Ave., Chicago.

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As superintendent of an electric light or power plant by one who is a graduate of both mechanics and electricity, and holds papers for the same. Have three years of practical experience; used to handling men. Address "SUPERINTENDENT," care WESTERN ELECTRICIAN.

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Winders direct from T.H. and Westinghouse shops. Work guaranteed. Ten years' experience. Light plants installed complete. Send for prices.

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10,000 New Rubber Storage Battery Jars for sale cheap. Old electrical material bought and sold.

WALSH'S SONS & CO.,
NEWARK, N. J.

NOTICE

TO TELEPHONE CONSTRUCTION CO'S.

Sealed bids will be received at the office of Jno. S. Elliott, at the Farmers Bank in the City of Boonville, Missouri, until 2 o'clock p. m., Thursday, March 23rd, 1899, for the construction and equipment of a telephone exchange in the City of Boonville. Specifications and instructions to bidders may be had by personal application at the office of the company in Boonville, Mo. The right is reserved to reject any and all bids.

Boonville Telephone Co.,
Boonville, Mo.

POSITION WANTED.

Electrical expert and trouble man experienced with dynamos, motors, arc lamps, modern electric elevator apparatus, etc.; also energetic salesman; good record. Address "EXPERT," care Western Electrician.

LARGE FOUNDRY AND MACHINE SHOP PLANT IN CHICAGO.

Foundry fully equipped, machine shop partially. Plant splendidly located. Ample ground and fine R. R. switching, for sale or rent. Address "FOUNDRY," care Western Electrician.

FOR SALE.

One Gresley Testing Bridge; one Queen Testing Bridge; perfect condition; \$20.00 each. J. G. BOARD ENGRAVING CO., 182 S. Clinton St., Chicago.

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Electric-light plant, all or one-half interest to an electrician or good engineer who can run the plant. Is paying 20 per cent. on cost. For particulars, etc., address CHANUTE ELECTRIC LIGHT & POWER CO., Chanute, Kans.

FOR SALE.

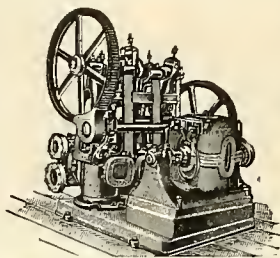
An electric-light plant for sale in a Kentucky town, with a paying patronage. For information, apply to GENERAL ELECTRIC COMPANY, Cincinnati, or GRADY & NAIVE, Versailles, Ky.

For Sale at Bargain. POWER GENERATORS.

Two M. P. Generators, 175 h. p., speed 55, revolutions for 350 v. D.C.; also 250 and 310 volts dynamos and motors, switchboards and instruments.

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SMITH-VAILE TRIPLEX PUMPS.

OPERATED BY ELECTRIC MOTOR.

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Pumping Machinery for Every Possible Duty. New Catalogue Free.

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— LOWEST PRICES —

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RHEOSTATS.

Automatic Motor Starters. Overload Motor Starters.

Automatic Pump Starters.

Belted Elevator Starters.

Automatic Speed Regulators.

THE CHICAGO RHEOSTAT CO., 1649-50 Marquette Building, Chicago.

Scrap Copper Wire Wanted.

If you have any Old Copper Wire of any description to dispose of, it will pay you to communicate with us, as we are 2 1/2 all times in the market for any quantity of Scrap Copper Wire, at the highest market values. We pay cash and send prompt returns. We are also supplying the electrical trade with our high grade Babbitt, Cotton Waste, Solder, Etc. Please communicate with us.

SWARTS METAL REFINING CO.,

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BARAINS IN DYNAMOS, ENGINES.

Write for Price List No. 22.

Direct Current Dynamos, Alternating Current Dynamos, Arc Dynamos, Engines, Boilers, Heaters, Pumps, all sizes. This apparatus has been in use in our own stations, and we therefore know its exact history, and can state that it is in thoroughly good operative condition.

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FOR SALE

— IN CHICAGO WAREHOUSE. —

200 single cell Oak Telephones (series type), "Western Giant A."

200 capacity lightning arresters and fuse board.

300 capacity (200 installed) metallic circuit switchboard—all in one section of Western multiple type cabinet.

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EVERYBODY KNOWS STEWART.

STEWART ELECTRICAL CO. CINCINNATI, O.

Write us for prices on anything in the following list or any other machinery wanted. This list comprises a few of our large stock.

<p>Generators, 500 volt.</p> <p>One T.-H. class 16, 40 k. w.</p> <p>Two Edison No. 20, 60 k. w.</p> <p>Four Edison No. 82, 100 k. w.</p> <p>Two T.-H. m-p., 75 k. w.</p>	<p>Motors, 500 volt.</p> <p>One 1/2 h. p. Keystone.</p> <p>One 1 h. p. T.-H.</p> <p>Two 7/8 h. p. T.-H.</p> <p>One 10 h. p. Eddy.</p> <p>One 25 h. p. Brush.</p> <p>One 50 h. p. T.-H.</p>
<p>Dynamos.</p> <p>Two 200 light, 16 c. p., 110 volt.</p> <p>One 100 light, 16 c. p., 110 volt.</p> <p>Two 2,000 c. p. T.-H. L. D. 2, 35 light.</p> <p>One 2,000 c. p. Standard, 40 lt.</p> <p>One 3,000 c. p. Brush, 1 lt.</p> <p>One 10 ampere Wood, 3 lt.</p>	<p>Motors, 220 volt.</p> <p>One 3/4 h. p. Varwick.</p> <p>One 7/8 h. p. Mather.</p> <p>One 10 h. p. Dait.</p> <p>One 15 h. p. Eddy.</p> <p>One 16 h. p. Edison.</p>

The above are second-hand, in good condition.

FOR SALE QUICK, 34 street cars, both open and closed, equipped each with pair No. 6 Edison motors at \$200 per car.

DEALERS IN & REPAIRERS OF ELECTRICAL MACHINERY

NEW SECOND HAND



The "Murdock" Receiver.

A STRICTLY HIGH-GRADE RECEIVER.

PONY TYPE.

DOUBLE POLE.

TURNUED HARD-RUBBER CASE.

PLATE BINDING POSTS.

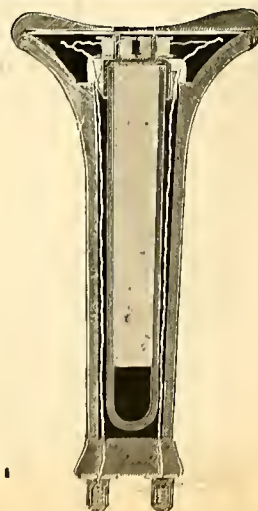
BEST IMPORTED STEEL MAGNETS.

WEIGHT, 12 OUNCES.

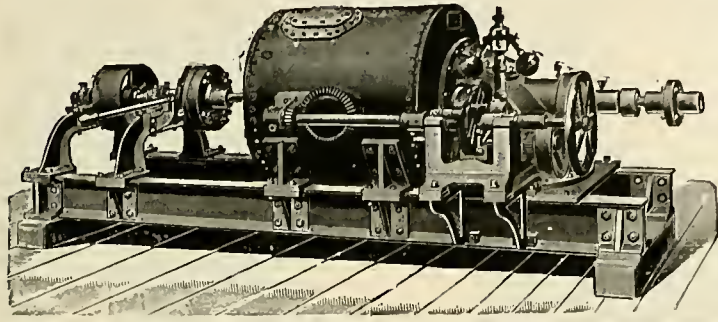
Magnet is supported near the diaphragm, so that the change in temperature does not affect adjustment.

WM. J. MURDOCK & CO., 160 Congress St., Boston, Mass.

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Victor Turbines Operating Dynamos.



That there are more Victor Turbines in use supplying power for electric generators than any other is due to the many points of superiority possessed by this Turbine.

FEATURES WORTH REMEMBERING:

- High Speed,
- Great Capacity,
- Perfect Cylinder Gate,
- Close Regulation,
- High Efficiency,
- Steady Motion.

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Central Manufacturing Co.,

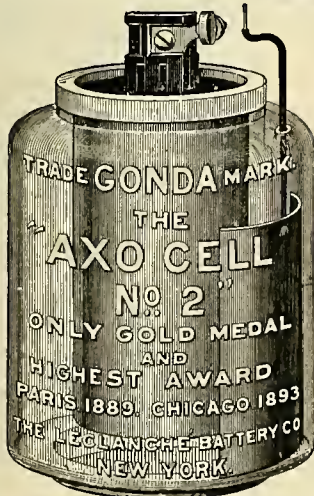
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Manufacturers and Dealers in
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F. O. B. cars, your city, in any quantity. Write us.

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WE CLEAN, REPAIR AND RENEW OLD BELTS.
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Practical Running of Dynamos.

A little booklet on the care and the locating and remedying of troubles in dynamos and motors.
Price, 10 Cents.
Catalogue of mechanical and electrical books free
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The Standard Open Circuit Batteries of the World.

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White Cedar Poles
AND STREET CAR TIES.
WHOLESALE PRODUCERS **PERRIZO & SONS, Daggett, Mich.**

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BEMIDJI, MINN., WHOLESALE DEALERS.
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Large Stock Constantly on Hand.

CEDAR POLES AND CROSSARMS

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CEDAR POLES
WE CONTROL THE OUTPUT OF CEDAR ON THE LINE OF THE WISCONSIN & MICHIGAN R.R. 55 MILES IN LENGTH COVERING A TERRITORY OF OVER 400 SQUARE MILES OF CEDAR FORESTS.
WE HAVE A LARGE STOCK OF ALL SIZES FOR PROMPT SHIPMENT.
NOTE: OUR QUOTATIONS ARE BASED ON ACTUAL STOCK ON HAND.
C. H. WORCESTER & CO. KOSS MICH.

Telephone Troubles and How to Find Them.

A complete hand-book for telephone inspectors, by Wm. H. Hyde and J. A. McManman, edited by Prof. C. H. Haskins.
SIXTH EDITION. 53 PAGES. PRICE, 25 CENTS.
The large number of telephone exchange managers and employes will find this book a great help in locating telephone troubles and remedies therefor. Sent prepaid on receipt of price, by the
Electrician Publishing Co., 510 Marquette Building, CHICAGO.

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Scrap and Native Platinum Purchased.
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LEADS THEM ALL.
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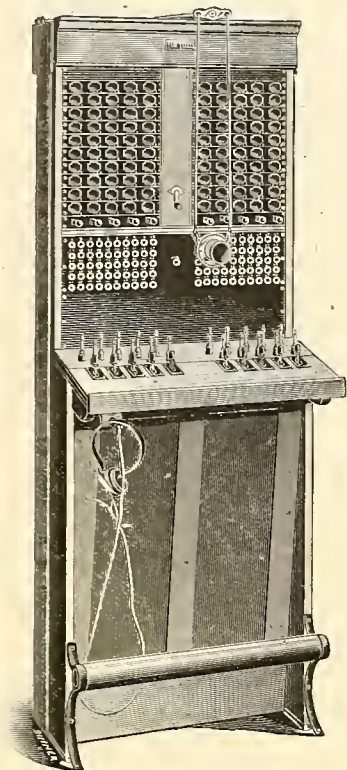
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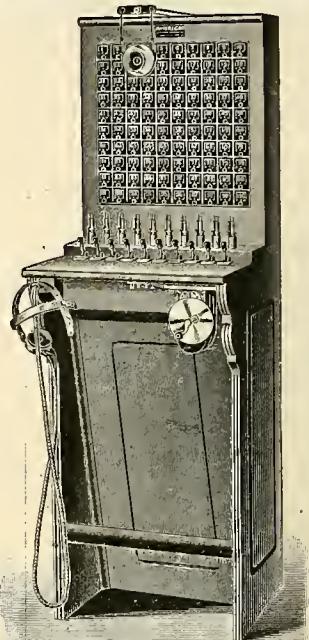
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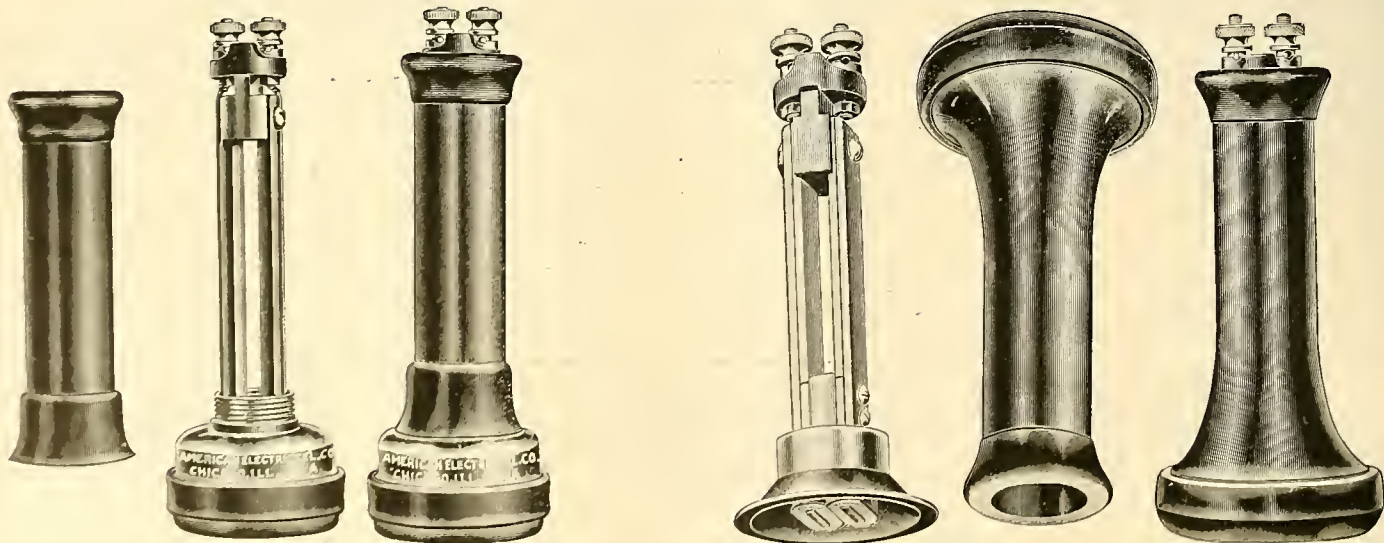
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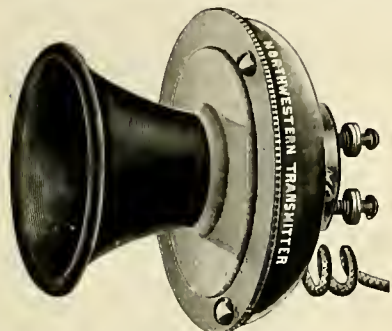
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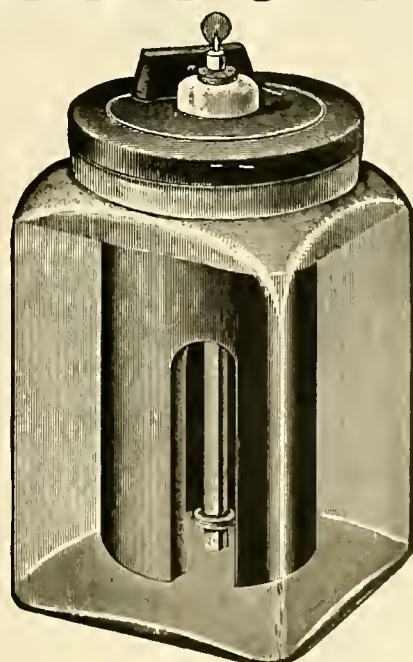
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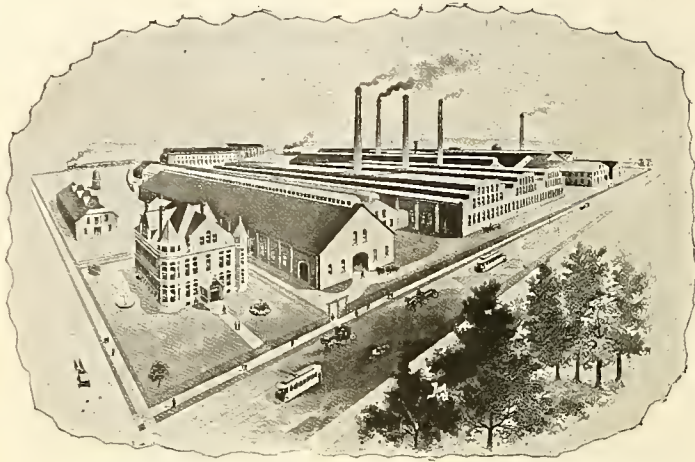
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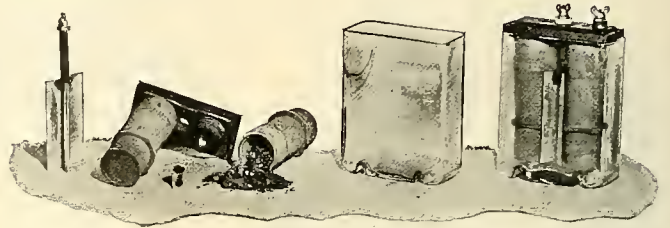
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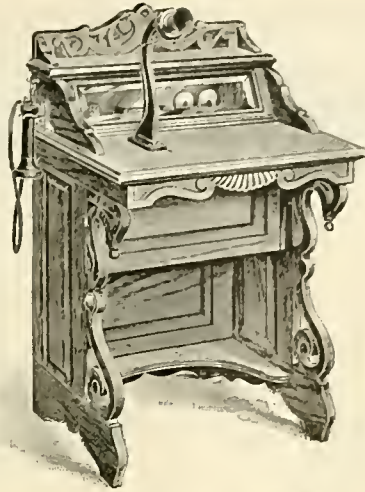
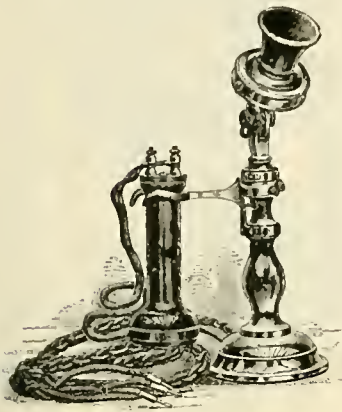
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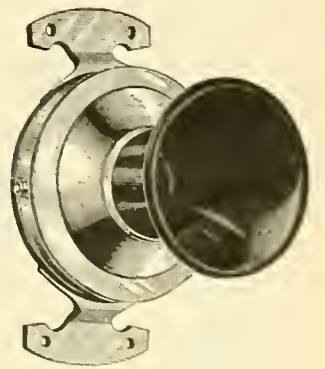
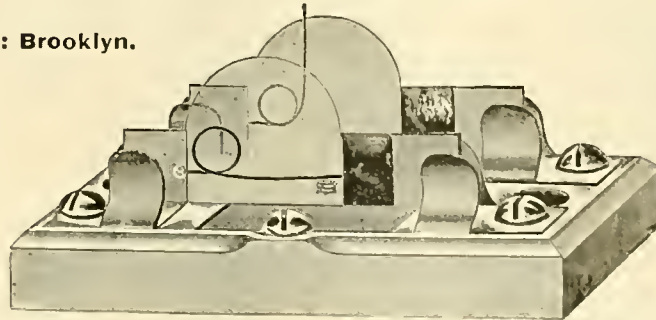
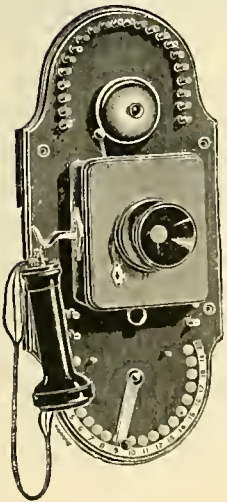
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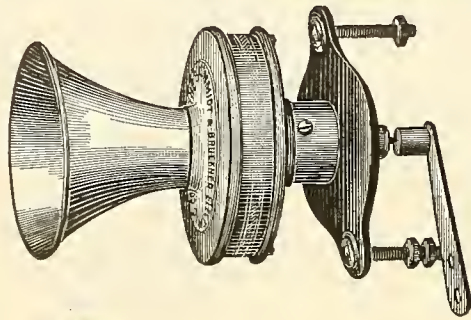
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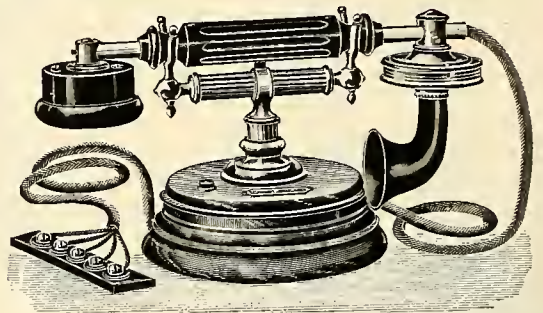
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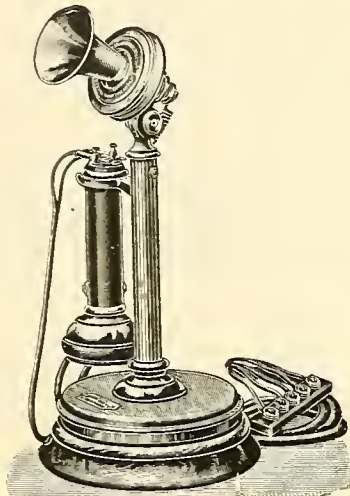
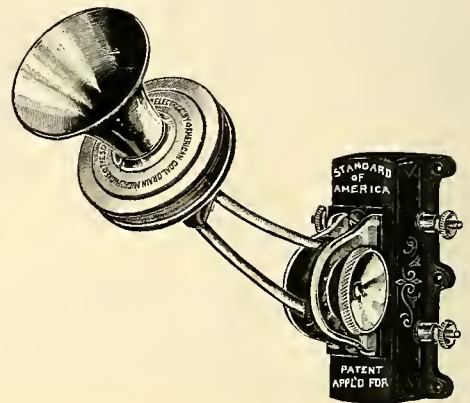


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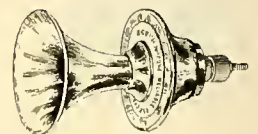


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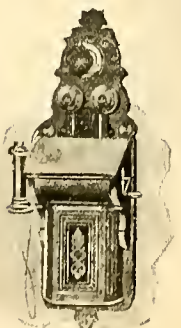
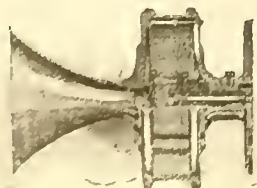
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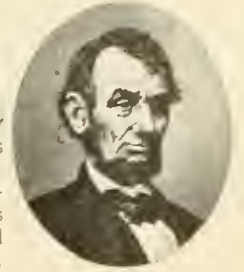
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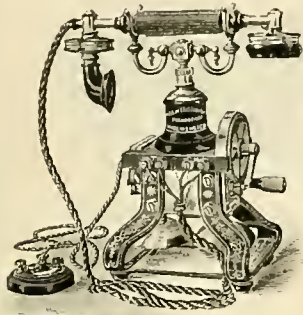
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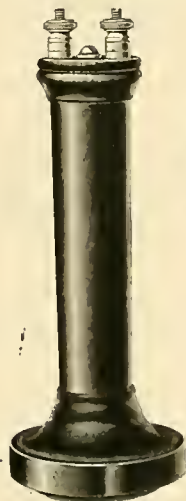
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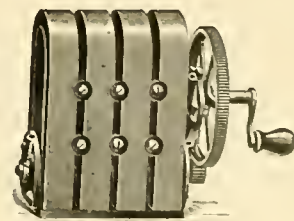
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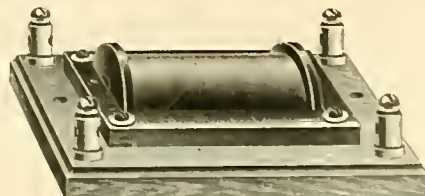
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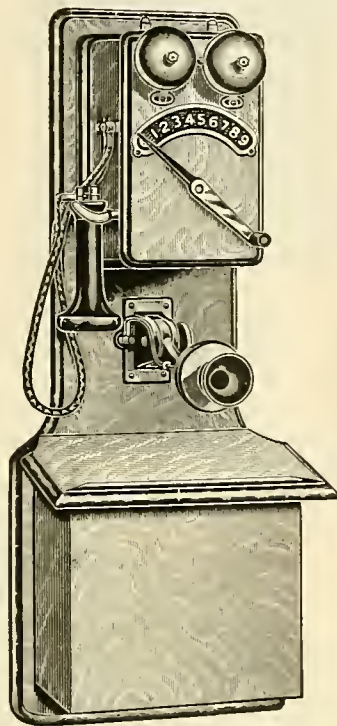
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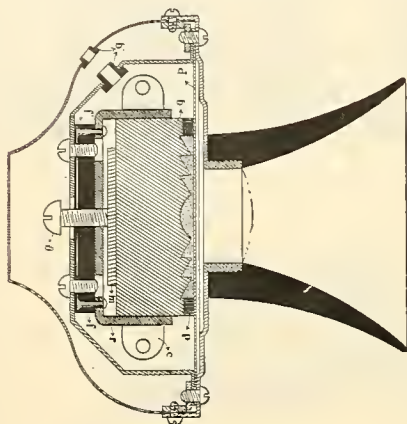
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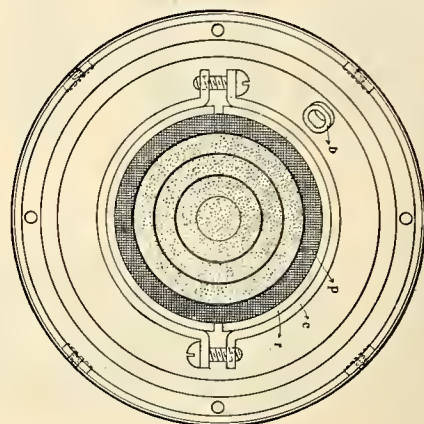
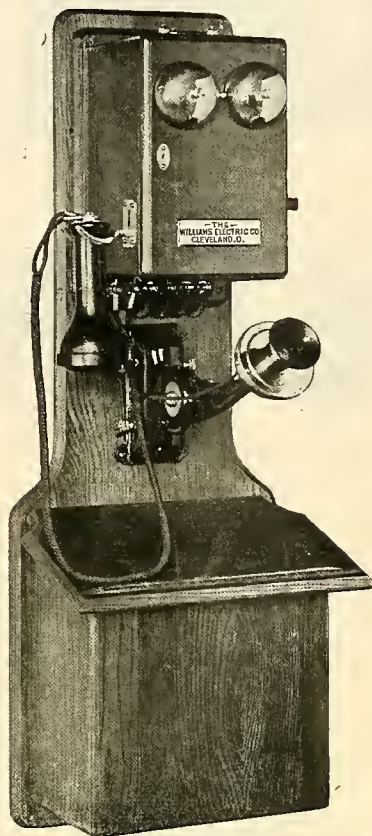
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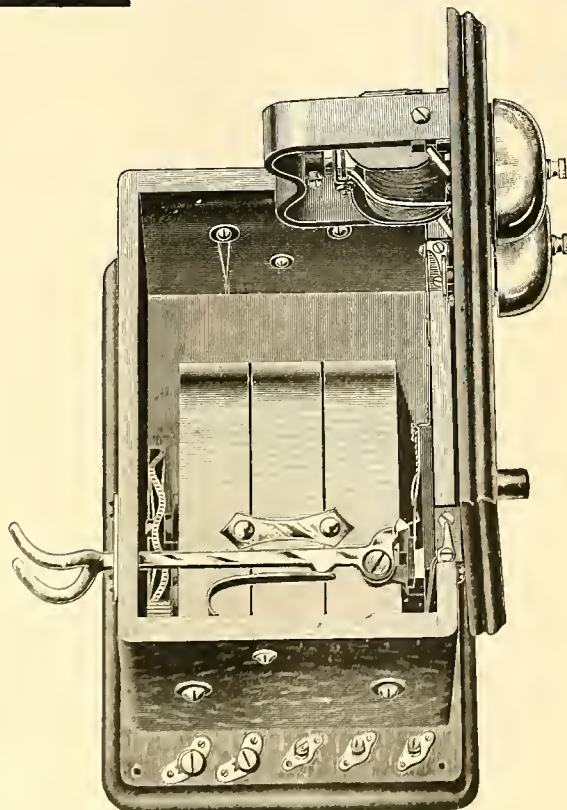
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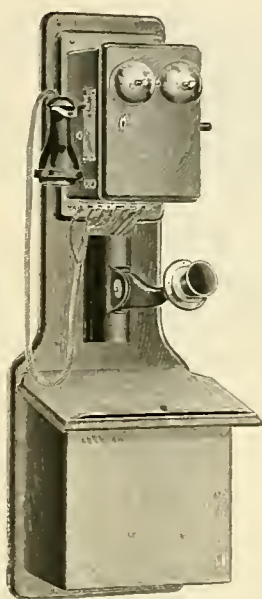
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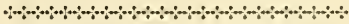
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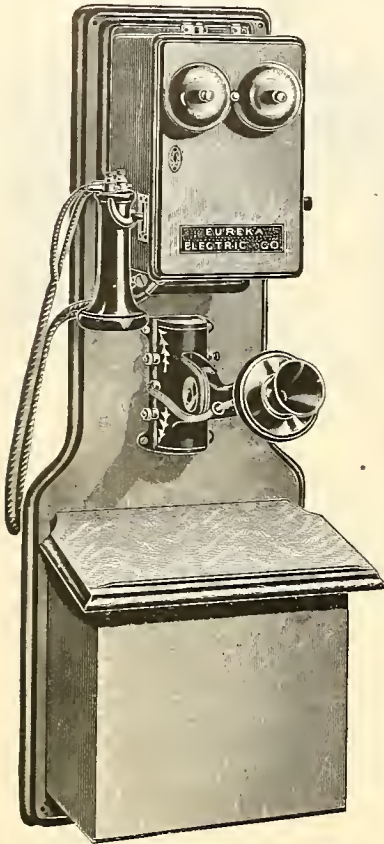
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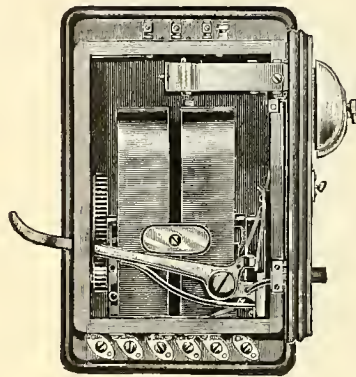
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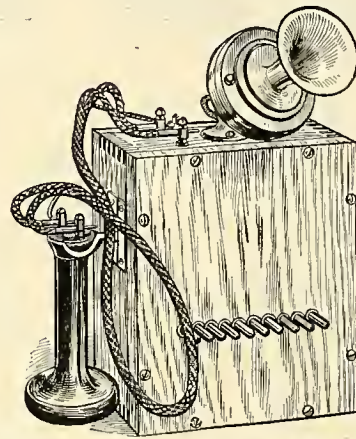


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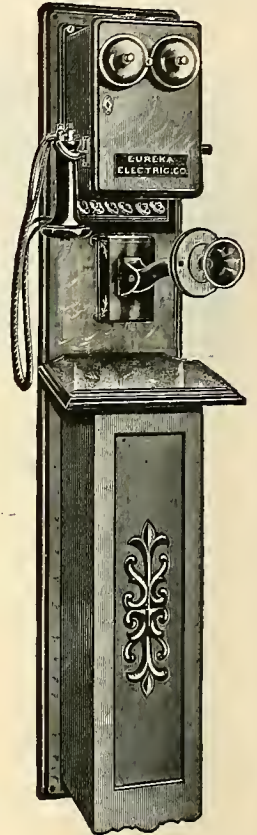
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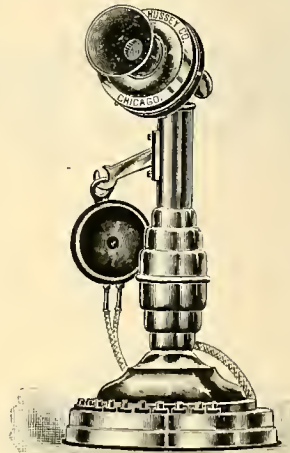
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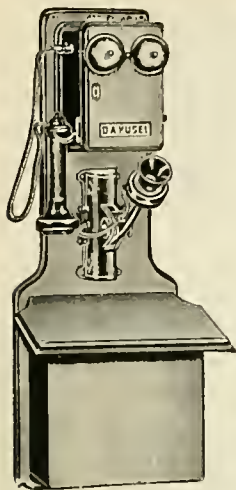
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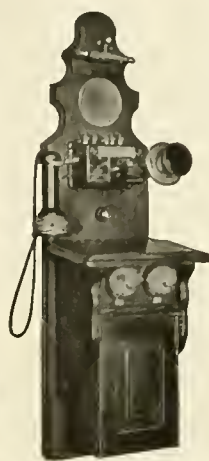
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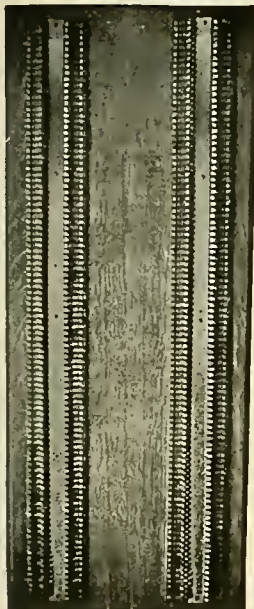
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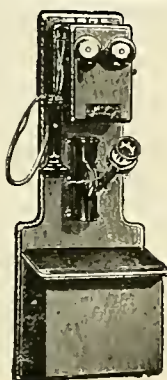


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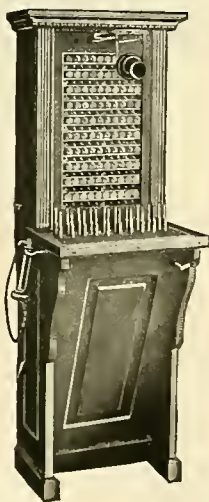
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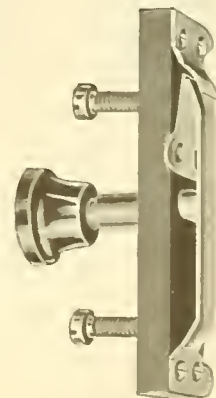
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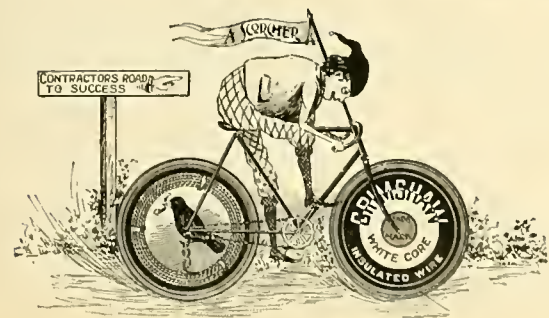
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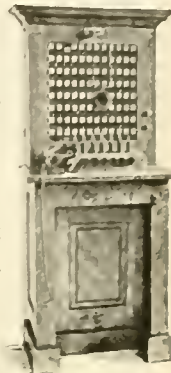
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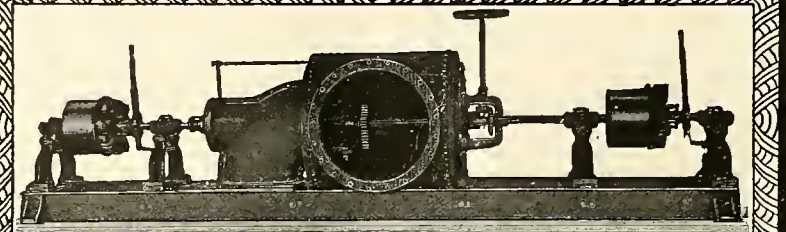
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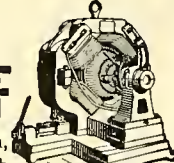
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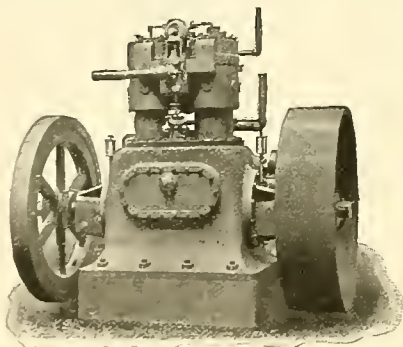
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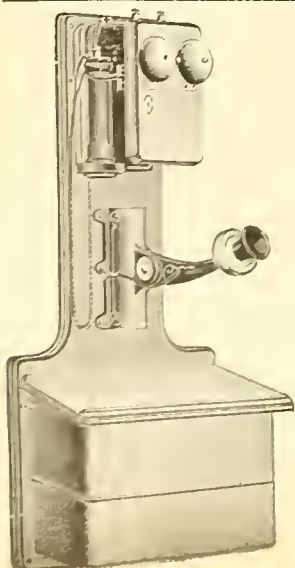
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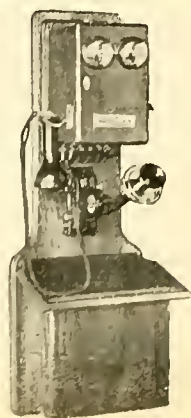
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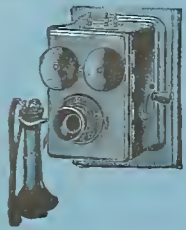
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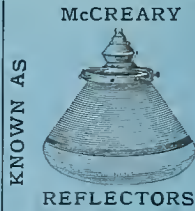
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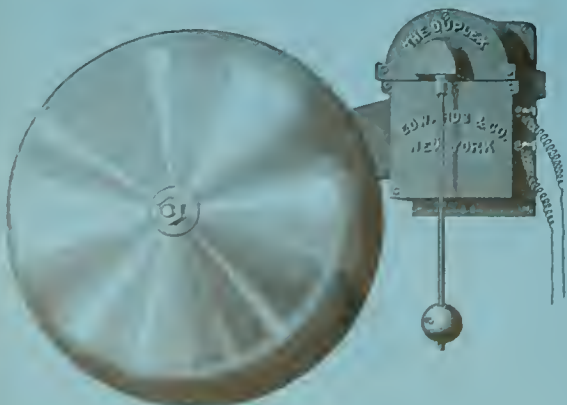
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Switchboard Instruments, X-Ray
Focus Tubes, Induction Coils

**I-T-E
CIRCUIT BREAKERS**

CUTLER ELECTRICAL CO., PHILADELPHIA

Standard Underground Cable Co.

542 The Rookery, Chicago. Westinghouse Bldg., Pittsburgh. 18 Cortlandt St., New York City. 1225 Betz Bldg., Philadelphia, Pa.
507 Security Building, St. Louis, Mo.

Electric Cables, Conduits, Wires and Accessories.
Also High Grade Rubber Covered Wires and Cables.

**THE BEST
ON EARTH**

TIPLESS LAMPS

THE SHELBY ELECTRIC CO.
SHELBY, OHIO

WESTON Electrical Instrument Co.,

114-120 William St., NEWARK, N. J., U. S. A.



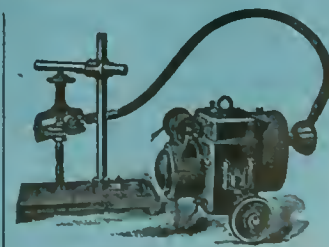
Weston Portable Galvanometer for Bridge Work.

Weston Standard Portable Direct Reading
Voltmeters, Millivoltmeters, Voltammeters,
Ammeters, Milliammeters,
Ground Detectors and Circuit Testers,
Ohmmeters, Portable Galvanometers.

Our Portable Instruments are recognized as **The Standard** the world over. The Semi-Portable Laboratory Standards are still better.

Our Station Voltmeters and Ammeters are unsurpassed in point of extreme accuracy and lowest consumption of energy.

Mention the **WESTERN ELECTRICIAN** when writing for catalogues.



ESTABLISHED 1875
**COMBINATION OF
Stow Flexible Shaft**

IRON CLAD ELECTRIC MOTOR.

Practically dust and water proof. For Lifting, Drilling, Tapping, Ramming, etc.

Write for Catalogue and Prices.
STOW MFG. CO., Binghamton, N. Y.
Gen'l European Agent, Seeley, Curtis & Peck, 85 Queen Victoria St., London, E. C.



The Direct Reading Ohmmeter

WILL ACCURATELY MEASURE RESISTANCE ON A RAPIDLY CHANGING ELECTRIC CURRENT.

No other ohmmeter can be used on circuits of rapidly changing current. A simple and accurate method of measuring resistance in a circuit.

The American Electric Supply Co.,

123 Liberty St., NEW YORK CITY

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ANNOUNCEMENT.

TO OUR PATRONS AND FRIENDS:

We have just opened our new branch offices in Chicago at 837-838 Marquette Building.

Our manager of Sales Department, Mr. M. E. Baird, will give this office his personal supervision for the present, assisted by a competent engineer from the factory, and will carry a full line of machinery in stock.

He will be pleased to see all his friends at his new quarters.

**THE EDDY ELECTRIC MFG. CO.,
WINDSOR, CONN.**

The "Chloride Accumulator"

ON THE SYSTEM OF
THE SOUTH SIDE ELEVATED RAILROAD COMPANY, CHICAGO.
From the Annual Report of the President, Jan. 26, 1899.

TRADE MARK:
"Chloride Accumulator"

REGISTERED SEPTEMBER 11, 1894.

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BOSTON, MASS., 69 State St.
CHICAGO, ILL., Marquette Bldg.
CANADA, The Canadian General Electric Co., Limited, Toronto, Ont.
SAN FRANCISCO, CAL., The Parrot Bldg.
BALTIMORE, MD., Equitable Bldg.
CLEVELAND, O., New England Bldg.

Storage Batteries.
"While the amount of current used per car mile is low, and has produced gratifying results in all tests and comparisons made, the fluctuations of power above the average requirements are large, and the sudden demands on the power-house compelled us to prepare promptly for the heavier business of the winter, which, with increased number of cars in service, heat and light loads, would have been beyond the capacity of the power-house. Additional engine capacity could not be obtained in the time at our disposal, would have cost more money, and have been expensive to operate. We accordingly installed two batteries of 750 K. W. each, equidistant from the power-

house, at Twelfth and Sixty-first streets, respectively. These batteries have very greatly reduced the fluctuations and the maximum load at the power-house. While the output at the power-house is the same, the batteries charge at times of light traffic and discharge at times of heavy traffic, thus equalizing the work at the power-house, and relieving the engines and generators. This is certainly an economy, and it is further claimed, with what correctness I am not yet convinced, that they cheapen the cost of production. But I do know that they keep up the voltage at the ends of the line, enable your road to operate more cars, furnish increased facilities to patrons, and prevent damage to power-house machinery in case of sudden demand for increased power.

Bulletins describing this and other installations of Chloride Accumulators will be furnished upon request.

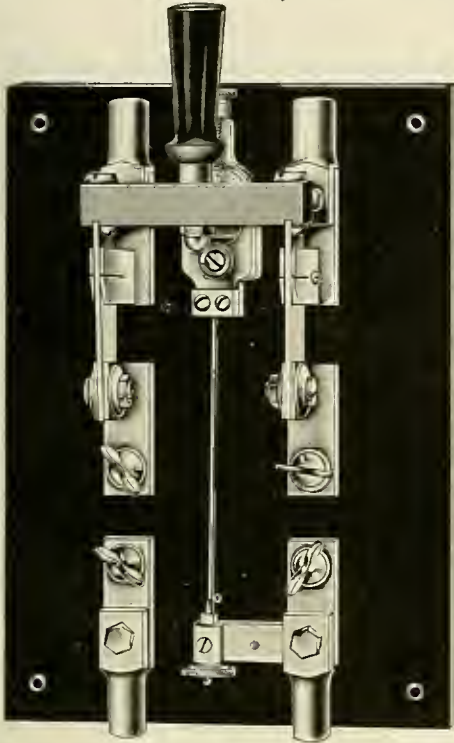
THE ELECTRIC STORAGE BATTERY COMPANY,
Drexel Building, Phila., Pa.

CATALOGUES.

Patented February 8, 1898.

Advantages of Buffalo Expansion Circuit Breakers.

- 1st. Simplicity.
- 2d. No fuses to replace.
- 3d. Low cost, little more than knife switch.
- 4th. Better than magnetic circuit breaker for motor work.
- 5th. Better than fuses for overload or short circuit.
- 6th. May be adapted to existing switches and switchboards.
- 7th. Can be placed in junction boxes on various floors where expense of magnetic circuit breakers would be prohibitive.
- 8th. For street railway cut-out boxes saves trouble of conductor replacing fuses.
- 9th. Good for direct or alternating currents.
- 10th. A 100 or 200 ampere switch may be opened on 1/2 ampere by simply changing expansion rod.
- 11th. The loss of energy is no more than with fuses.
- 12th. The switch is operative without any relation to the protective device.



The "BUFFALO" Expansion Circuit Breaker

Manufactured by

McCarthy Bros. & Ford,

45 N. Division Street, BUFFALO, N. Y.

ABSOLUTE SAFETY

IS ASSURED ALL USERS OF

McINTYRE'S Portable Electric Safety Lamp.



This is an Electric Lamp set in a White Enameled Parabolic Reflector, and can be attached to the cap or any part of the clothing by means of a stick pin attached to reflector and connected to the battery with a flexible cord. The battery is arranged to be carried on a belt or in the pocket, so the user has free use of hands. The current can be turned off when not in use. Dry Batteries are used and can be recharged from direct incandescent electric current. Charger and full directions go with each lamp.

IS USED BY THE FOLLOWING:

For Watchmen, Miners, Mine and Gas Inspectors, Boiler Shops, Oil and Gas Works and Gas Filters, City Sewer and Underground Cable Inspectors; Powder Mills and Warehouses where explosive materials are manufactured and stored; exploring cellars and trenches where leaks occur and investigating pipe connections where it is impossible to carry an oil lamp or candle for fear of explosion—and all parties requiring a safe, portable light. The whole outfit is neat and compact.
No. 1 Weighs 2 lbs. 1 1/2 C. P. Price complete, \$ 4.00. For meter reading only.
" 2 " 3 " 4 " " " " 6.00. For general use.
" 3 " 12 " 10 " " " " 12.00. For sev. persons to work by.

ELMER E. McINTYRE,
PITTSBURG, PA., U. S. A.

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Chicago Rheostat Co. x					

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HARDTMUTH CORED AND SOLID CARBONS

FOR DIRECT CURRENT ARC LAMPS.

WE HAVE IN STOCK THE FOLLOWING SIZES:

CORED CARBONS.

Diameter. Length.
 5-16 in. x 6 in., 6½ in., 7 in., 7½ in. and 8 in.
 3-8 in. x 7 in., 8 in., 9 in., 9½ in., 10 in. and 12 in.
 7-16 in. x 6 in., 7 in., 8 in., 9 in., 9½ in., 10 in. and 12 in.
 1-2 in. x 6 in., 7 in., 7½ in. and 8 in.
 5-8 in. x 12 in.

SOLID CARBONS.

Diameter. Length.
 7-16 in. x 7 in. and 10 in.
 1-2 in. x 6 in., 7½ in. and 12 in.

Having received a large consignment of these Carbons just before the new tariff went into effect, we are prepared to make very low prices. Send for price list.

CHICAGO EDISON COMPANY,

EDISON BUILDING, 139 ADAMS STREET, CHICAGO.

DON'T FORGET THE ADDRESS—

CASS & COMPANY,

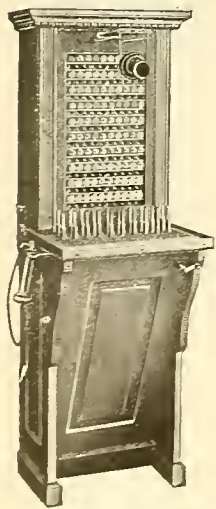
54-60 S. CANAL ST., CHICAGO,

NEW AND SECOND-HAND

**Dynamos and Motors,
Gas and Gasoline Engines.**

GENERAL WESTERN AGENTS S. E. I. Instruments for Switchboards, Onondaga Dynamos and Motors, Moloney Transformers, Perfection Dynamo Brushes, Cass Ground Detector Switches.

Have You Any Electrical Apparatus for Sale? Get Our Prices.



The
H. M. Fisk Mfg. Co.,
 Wheaton, Ill.

Manufacturers of

**Telephones, Switchboards and
Telephone Supplies.**

Exchanges constructed under very favorable terms. Our equipment is simplicity itself.

Note our Switchboard—no keys are used in its operation.

Telephones are a model of completeness.

Write for particulars and circular.

“A Terrible BURN *Vitogen*”

Covered two-thirds of body usual remedies failed very bad odor indication of blood poisoning. Applied Vitogen odor disappeared after second application wounds are entirely healed and patient discharged patient would have died of blood poisoning if it had not been for Vitogen. Case 897. Dr. Boyd.”

See page 10 “Vitogen in Practice.” Copy mailed free.

Sold by Druggists; 2 oz., 50c., 4 oz., \$1.00. Screw-cap bottles. Sent prepaid on receipt of price if your druggist hasn't it.

SOLE MFRS. The G. F. HARVEY CO., MANUFACTURING CHEMISTS, Saratoga Springs, N. Y.
 Canadian Branch, Mille Roches, Ont., KEZAR & BENNETT, Agts.

THE BEST ANSWER TO A QUESTION

On Wiring, can be found in the New Book,

“WIRING TABLES,”

“How They are Made and How to Use Them.”

BY THOS. G. CRIER.

Whenever you are asked a question on Wiring, refer the questioner to this book, and he will find what he desires.

THE BOOK CONTAINS: The Law of Resistance, Electromotive Force and Current Fully Explained. How to Calculate the Size of Wires. The Different Methods of Wiring, with Diagrams. How to Apply the Simple Formula in Calculating the Size of Wires Under all Conditions. Diagrams for Wiring 3 Point, 4 Point, Head Light and Heat Regulating Switches.

27 TABLES ON WIRING AND VALUABLE DATA.

Ohm's law is described in such plain and simple language that one cannot fail to clearly understand it.

Bound in Cloth, 80 Pages, Size 5x7½ in. Sent, prepaid, on receipt of price, \$1.00.

ELECTRICIAN PUBLISHING CO., 510 Marquette Building, CHICAGO.

HIGH GRADE INCANDESCENT LAMPS.

We have arranged to sell for 30 days a large stock of lamps, any voltage, base and efficiency, at 15 cents each. These lamps are new and are backed up with a written guarantee.

CHAS. A. COOPER & CO., 608 Roe Bldg., St. Louis.

BUCKEYE

INCANDESCENT LAMPS.

Monadnock Building, Chicago.

QUALITY
 UNEQUALED.
 FACTORY
 PRODUCTION
 TRIPLED.

THE BUCKEYE ELECTRIC CO., Cleveland, Ohio.

OKONITE WIRE.

Standardized
for Construction
in Electric

Lighting,
Railway,
Telephone,
Telegraph,
Fire Alarm and
Police Signal Service.

Because
Possessing
Highest
Properties of

Insulation,
Conductivity,
Flexibility,
Withstanding Climatic Changes,
Resistance to Abrasion and
Non-Action by Lime and Acids.

Okonite and Manson Tapes have an enviable adhesive record. Okonite Wire and Products are shipped from stock by the

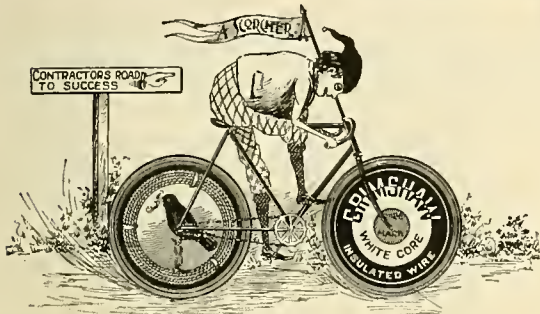
CENTRAL ELECTRIC COMPANY,

264-266-268-270 FIFTH AVENUE, CHICAGO.



VICTOR CIRCUIT BREAKER.

F. A. LA ROCHE & CO., 13th and Hudson Streets, NEW YORK.



Grimshaw White Core,

RAVEN WHITE CORE, RAVEN BLACK CORE, COMPETITION LINE WIRE, GRIMSHAW AND COMPETITION TAPES AND SPLICING COMPOUNDS.

New York Insulated Wire Company,

MAIN OFFICE: 13-17 Cortlandt St., New York.

BRANCHES: CHICAGO: 320 Dearborn St.

BOSTON: 134 Congress St.

SAN FRANCISCO: 71 Flood Building.

GENERAL INCANDESCENT ARC LIGHT CO.,

GENERAL OFFICES AND FACTORY:

572, 574, 576 and 578 FIRST AVE., bet. 33d and 34th Sts., NEW YORK.

MANUFACTURERS OF THE

BERGMANN ENCLOSED ARC LAMPS

FOR ALTERNATING AND DIRECT CURRENT CIRCUITS.

All Drawn Pure Copper Blade Switches.
Attaching Plugs and Flush Receptacles.

Flush Push Switches,
Automatic Switches and other
High-Grade Electrical Specialties.

SALES OFFICES:

CHICAGO: MARTIN J. INSULL, 1012-1013 Monadnock Block,

NEW YORK: GENERAL INCANDESCENT ARC LIGHT CO., 39-41 Cortlandt St.



Flickering of lights usually occurs when the station is being crowded. It is self-evident that this flickering is caused by the slipping of belts, and as a belt full of Cling-Surface runs steadily and positively beyond all possibility of slipping, the importance of this fact can be readily seen.

CLING-SURFACE MFG. CO., 177-182 VIRGINIA ST., BUFFALO, N. Y.

CLASSIFIED INDEX OF ADVERTISEMENTS.

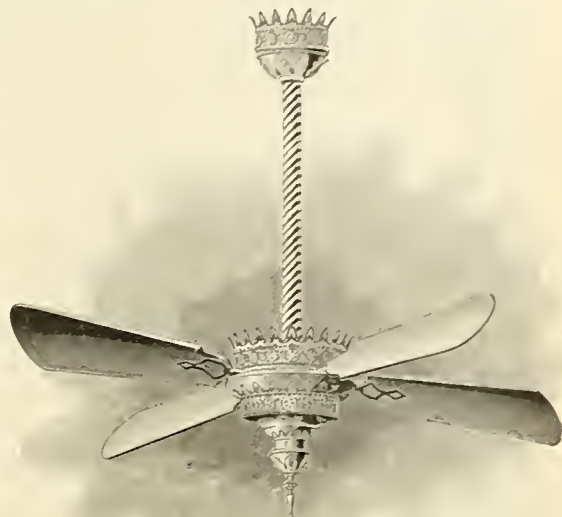
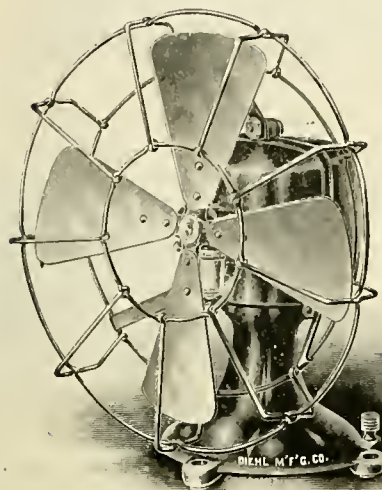
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Leather Preserver Mfg. Corp.
- Belting.**
Leather Preserver Mfg. Corp.
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Shultz Belting Co.
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Commercial El. Supply Co.
Electric Appliance Co.
Hoebel & Manger.
Western Elect. Supply Co.
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General Electric Co.
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Wagner Elec. Mfg. Co.
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Bealy & Co., Chas. H.
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General Electric Co.
Illinois Electric Co.
National India Rubber Co.
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Western Elect. Supply Co.
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Samson Cordage Wks.
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Int. Correspond. Schools.
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Electric Appliance Co.
Farr Tel. & Cons. Sup. Co.
Western Elect. Supply Co.
Wyckoff Creosoting Co.
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Bossert Elec. Const. Co.
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Chicago Edison Co.
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Edwards & Co.
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Emerson El. Mfg. Co.
General Elec. Co.
Illinois Electric Co.
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American El. Specialty Co.
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McCarthy Bros. & Ford.
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Queen & Co.
S. E. I. Co.
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Western Elect. Supply Co.
Westinghouse El. & Mfg. Co.
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Lea Mfg. Co.
Ohio Elec. Specialty Mfg. Co.
Western Elect. Supply Co.
- Electro-Plating Mach'y.**
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General Electric Co.
- Employment Agency.**
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Westinghouse Machine Co.
- Engines, Steam.**
Ball Engine Co.
Westinghouse Machine Co.
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Commercial El. Supply Co.
Dielm Mfg. Co.
Emerson El. Mfg. Co.
General Electric Co.
Illinois Electric Co.
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Paragon Fan Motor Co.
Wagner Electric Mfg. Co.
Western Electric Co.
Western Elect. Supply Co.
Westinghouse El. & Mfg. Co.
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Delaware Hard Fibre Co.
Kartavri Mfg. Co.
Vulcanized Fibre Co.
- Files.**
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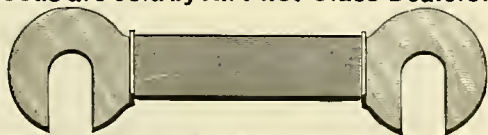
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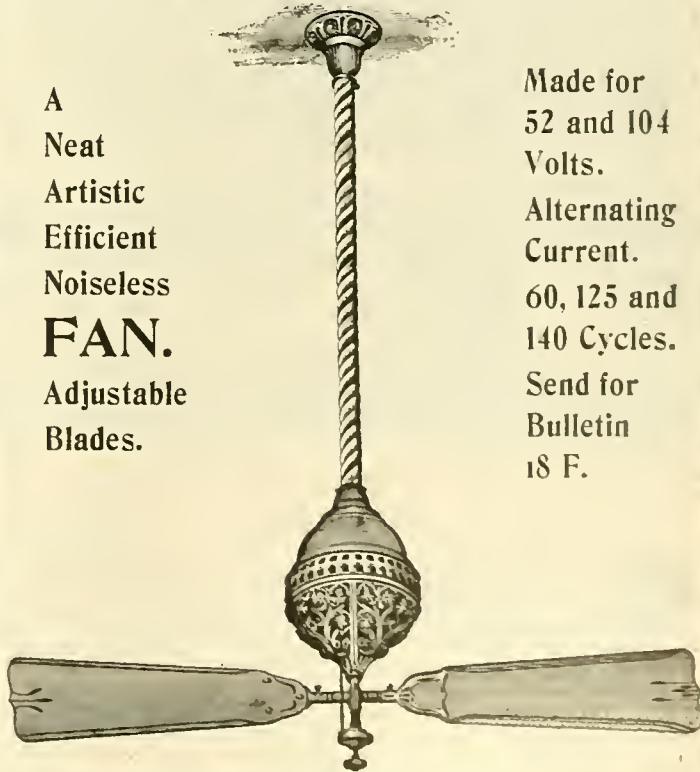
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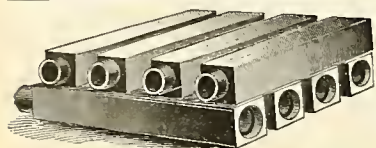
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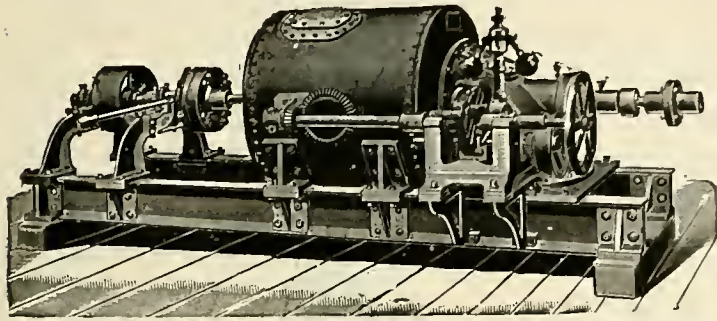
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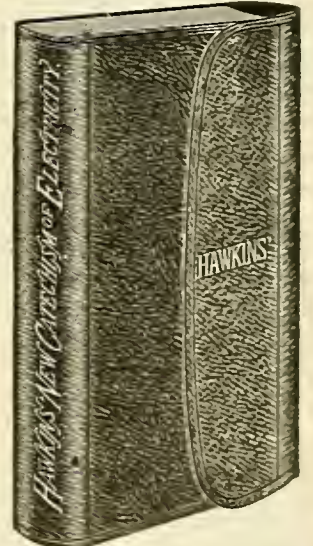
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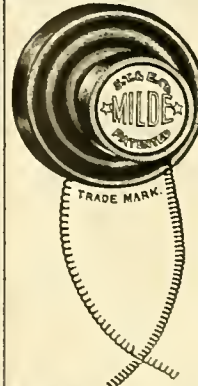
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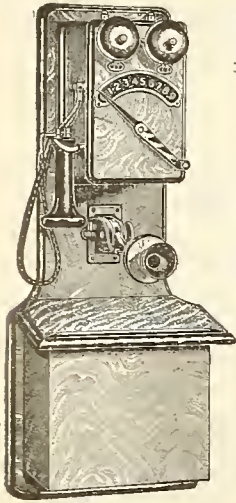
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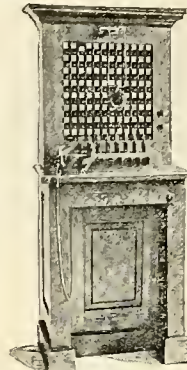
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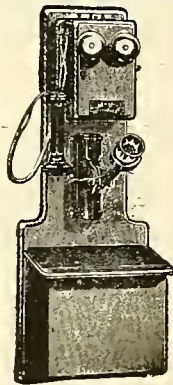
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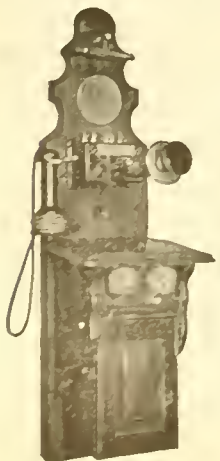
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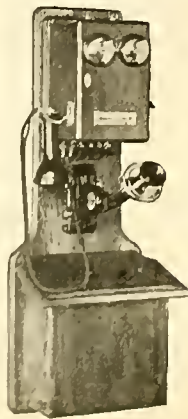
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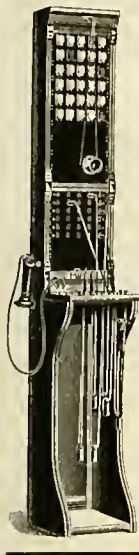
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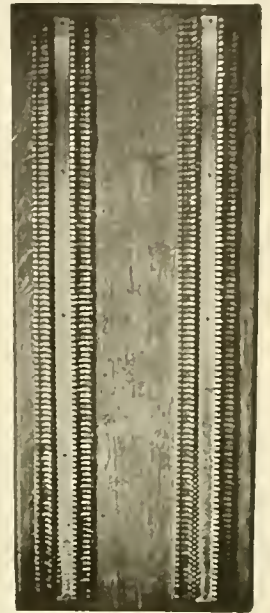
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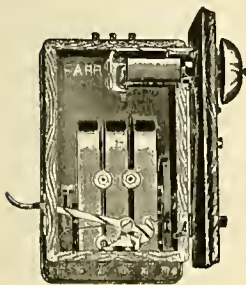
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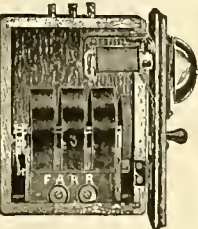
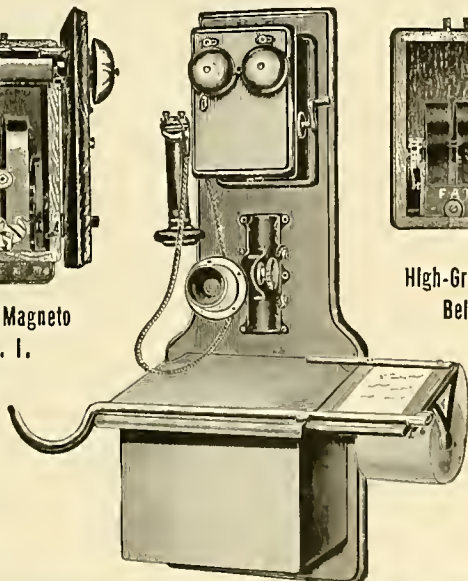
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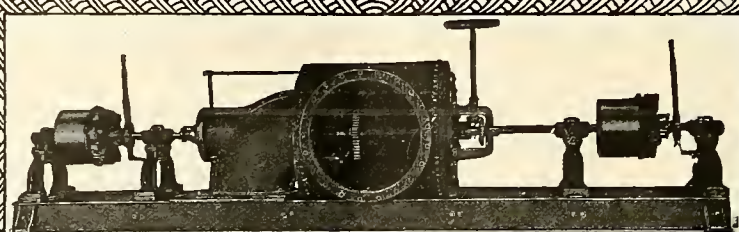
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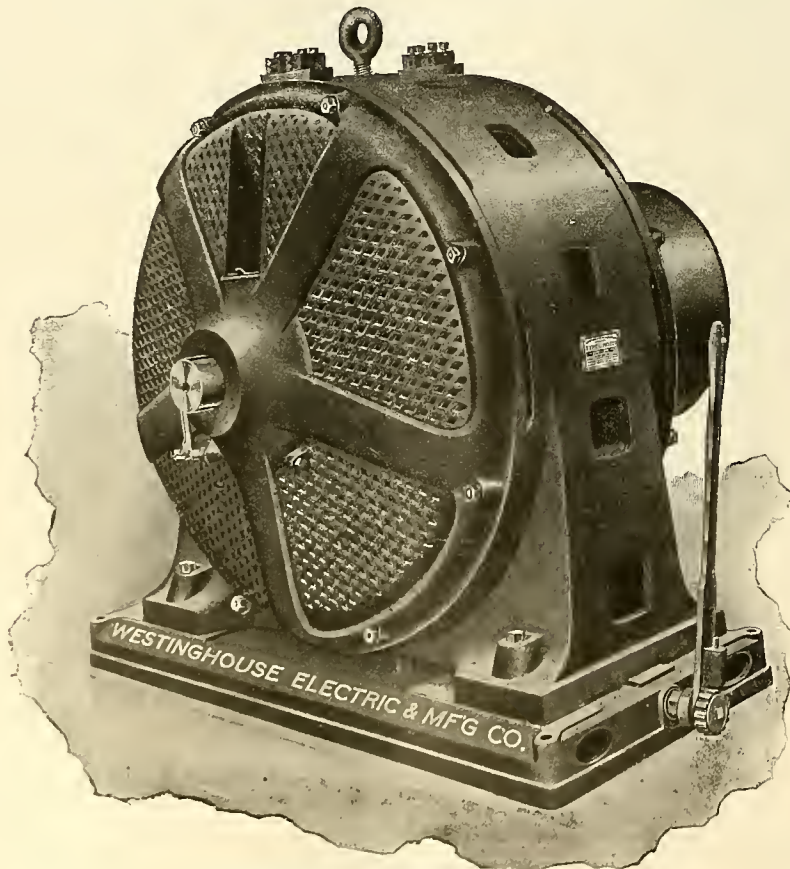
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Your Never Slip Pulley Covering is giving good satisfaction. Send us another gallon at once. American Elec. Lt. Co., Kan. City, Mo.

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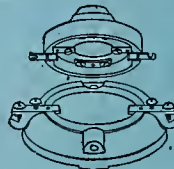
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Highest grades for electrical insulation and mechanical purposes, in sheets, tubes, rods and special shapes. Catalogues and samples on application.

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MAKING ROSETTES OUR SPECIALTY

Write for full particulars, free Samples, etc. Clear-Concealed-Combination-Sq. Base

ROSETTES

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The Bossert Electric Construction Co.

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Special Prize Gold Medal at Atlanta, 1895.
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Wound for any Voltage Direct or Alternating.
For Ceiling or Desk - A Written Guarantee with each FAN.
D.L. BATES & BRO.,
DAYTON, O.

Western Electrician

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Vol. XXIV. CHICAGO, MARCH 25, 1899. No. 12

SIMPLEX INSULATED WIRES AND CABLES.
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ERICSSON SWEDISH BI-POLAR RECEIVER
 THE BEST WHY NOT HAVE IT?
ERICSSON TELEPHONE CO.
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C.-H. RHEOSTATS
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 WILL ACCURATELY MEASURE RESISTANCE ON A RAPIDLY MOVING ELECTRIC CAR.
 No other instrument can meet such difficulties of stray magnetism and vibration. A boy can use it. The brains are in the box.
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 BY USING
The KINSMAN DESK LAMP
 Which is the only fixture made that will properly light a roll-top desk and at the same time shield the eyes. Beware of the numerous cheap imitations in the market.
McLEOD, WARD & CO.,
 27 Thames Street, NEW YORK



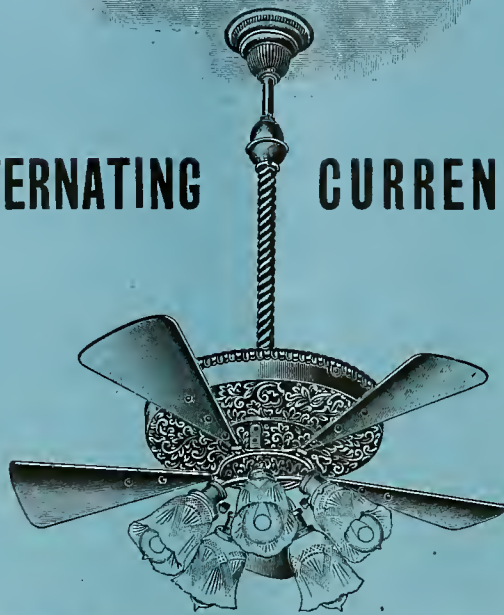
Send for Descriptive Catalogue and Latest Quotations.

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Fan Motors

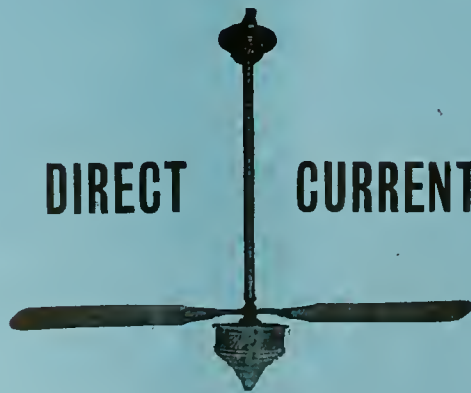
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GREAT REDUCTION IN PRICE.

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Cheapest.



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Sample will be sent upon approval to any user in any part of the world.

Write for Complete Price List and Discounts.

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Motor Starters with Automatic Release.

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	500	SI 51	4.50	Vedlus
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10	125	SI 180	8.70	Variabra
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15	125	SI 1120	19.20	Vasbil
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30	125	SI 1230	36.00	Vettins
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40	125	SI 1288	36.00	Vellunim
	250	SI 2141	30.00	Vellocassi
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Prices on larger sizes upon application.

NOW READY—Catalogue No. 10.

A New Pocket Battery Gauge, to retail \$3.50, will be ready Nov. 1st. Something New in Burglar-Alarm Traps now ready. A lot of specialties we are now making can be purchased at the right price.

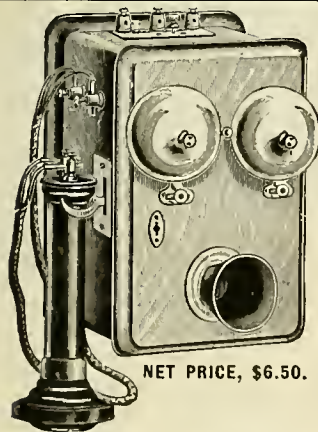
THE MESCO DRY BATTERY (better than ever).

Prices to suit buyers who are using cheaper grades.

We are Manufacturers of Miniature Incandescent Lamps.

MANHATTAN ELECTRICAL SUPPLY CO.

32 CORTLANDT STREET, NEW YORK.



NET PRICE, \$6.50.



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We have the Largest and Most Complete Electrical

REPAIR SHOPS

In the West. ELECTRICAL REPAIRS AND MACHINE WORK OF EVERY DESCRIPTION. In having your repair work done by a company operating hundreds of dynamos and motors you are sure of good work and get the benefit of our experience.

CHICAGO EDISON COMPANY,

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General Incandescent Arc Light Co.

MANUFACTURERS OF THE

Bergmann Enclosed Arc Lamps, Switches,
And Other High-Grade Electrical Specialties.

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CHICAGO:

MARTIN J. INSULL Co.,
1012-1013 Monadnock Block.

ABSOLUTE SAFETY

IS ASSURED ALL USERS OF

McINTYRE'S

Portable Electric Safety Lamp.

Fort Wayne Electric Corporation,

FORT WAYNE, IND.

Apparatus for

Arc, Direct Current and Alternating
Incandescent Lighting and
Power Transmission.



This is an Electric Lamp set in a White Enamelled Parabolic Reflector, and can be attached to the cap or any part of the clothing by means of a stick pin attached to reflector and connected to the battery with a flexible cord. The battery is arranged to be carried on a belt or in the pocket, so the user has free use of hands. The current can be turned off when not in use.

Dry Batteries are used and can be recharged from direct incandescent electric current. Charger and full directions go with each lamp.

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For Watchmen, Miners, Mine and Gas Inspectors, Boiler Shops, Oil and Gas Works and Gas Filters, City Sewer and Underground Cable Inspectors, Powder Mills and Warehouses where explosive materials are manufactured and stored, exploring cellars and trenches where leaks occur and investigating pipe connections where it is possible to carry an oil lamp or candle for fear of explosion—and all parties requiring a safe, portable light. The whole outfit is neat and compact.

No. 1 Weighs 2 lbs. 1½ C. P. Price complete, \$ 4.00. For meter reading only.
" 2 " 3 " 4 " " " 6.00. For general use.
" 3 " 12 " 10 " " " 12.00. For sev. persons to work by.

ELMER E. McINTYRE,
PITTSBURG, PA., U. S. A.

NEW DESIGNS

**BATES ELECTRIC
FANS**

Wound for any Voltage
Direct or Alternating.

For Ceiling or Desk
A Written Guarantee
with each FAN.

D.L. BATES & BRO.
DAYTON, O.



WOOD'S MOTO-VEHICLES.

THE WOOD ELECTRIC MOTO-VEHICLES.

SEND FOR "SPECIALLY FINE" CATALOGUE.

AMONG OTHER THINGS WE GUARANTEE ARE:

That the material and workmanship in the vehicle shall be of the very best, including rubber tires and ball bearing axles.

That for a period of one year the Company will replace, free of charge, any broken parts due to defective material or faulty shop construction.

That the vehicle shall have, on a level hard roadway, a mileage capacity in one charge of the batteries that will carry its given load twenty-five miles at an average speed of twelve and one-half miles per hour, two hours.

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That the vehicle shall be capable of climbing a six per cent. grade with given load when batteries are reasonably well charged.

That for the sum of \$50.00 per annum, the Company will furnish all parts for keeping batteries in perfect repairs for a period of five (5) years, leaving them at the end of the five years in good condition for operation during the ensuing year.

AVERAGE COST TO RUN PER MILE, 3-4 CENT.

FISCHER EQUIPMENT CO.,

110-112 EAST TWENTIETH STREET, CHICAGO, ILL., U. S. A.



Liquified Air



in 1904 may be in use for cooling and ventilating purposes!

But do you intend sweltering five summers awaiting the solving of an unknown proposition?
We have a system for heat-relief which has been in service ten years with known results.
Write us about our cooling and ventilating devices.



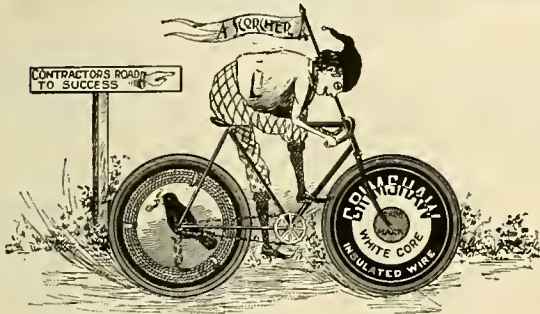
CENTRAL ELECTRIC COMPANY,

264-266-268-270 Fifth Avenue, CHICAGO.



VICTOR CIRCUIT BREAKER.

F. A. LA ROCHE & CO., 13th and Hudson Streets, NEW YORK.



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New York Insulated Wire Company,

MAIN OFFICE: 13-17 Cortlandt St., New York.

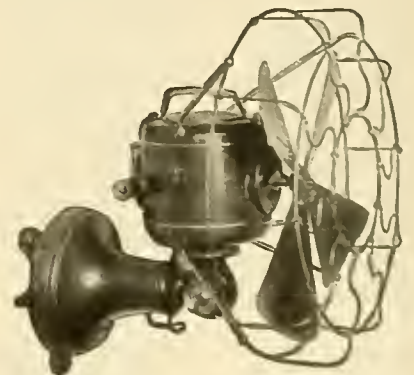
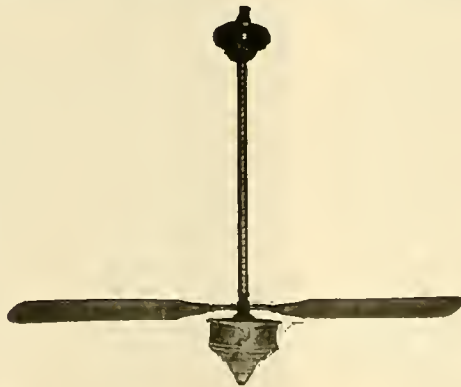
BRANCHES: CHICAGO: 320 Dearborn St.

BOSTON: 134 Congress St.

SAN FRANCISCO: 71 Flood Building.

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BETTER THAN EVER (IF POSSIBLE).



The only FAN MOTOR that is sold in carload lots. Handled by all leading Supply Houses.

1899 CATALOGUE NOW READY.

Our New Ceiling Fan defies competition and the price is lower than anything on the market. All our goods can be seen at our New York Salesroom. Don't fail to get Paragon prices before placing orders.

PARAGON FAN & MOTOR CO.,

WESTERN OFFICE:

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CHICAGO.

39-41 CORTLANDT STREET, NEW YORK.
TELEPHONE 3893 CORT.

Eastern Agents for Emerson Alternating Fans and Power Motors.

Flickering of lights usually occurs when the station is being crowded. It is self-evident that this flickering is caused by the slipping of belts, and as a belt full of Cling-Surface runs steadily and positively beyond all possibility of slipping, the importance of this fact can be readily seen.

CLING-SURFACE MFG. CO., 177-182 VIRGINIA ST., BUFFALO, N. Y.

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Western Electric Co.
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Reidinger, Huro.
Western Elect. Supply Co.

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Western Electric Co.
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National India Rubber Co.
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Central Mfg. Co.
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Electric Appliance Co.
Farr Tel. & Cons. Sup. Co.
Western Elect. Supply Co.
Wyckoff Creosoting Co.

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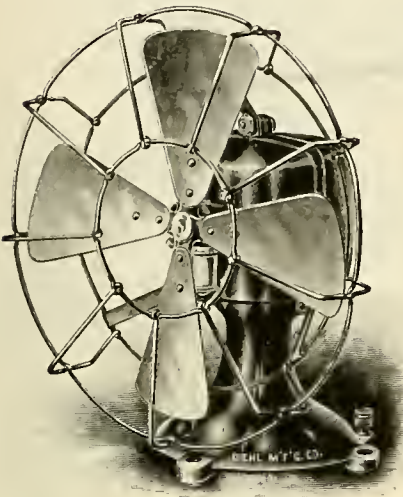
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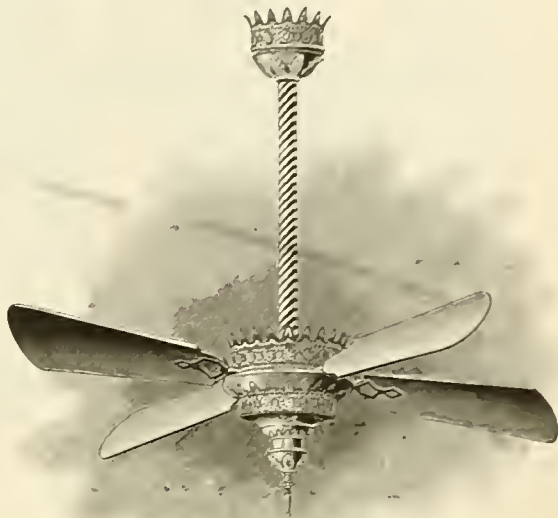
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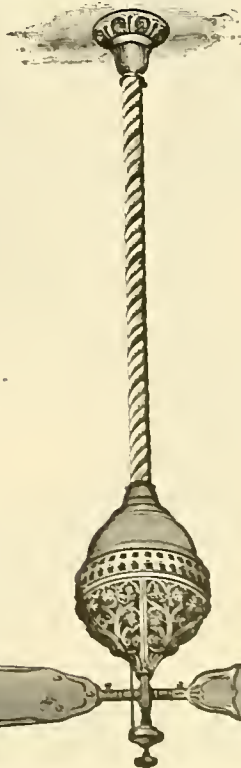
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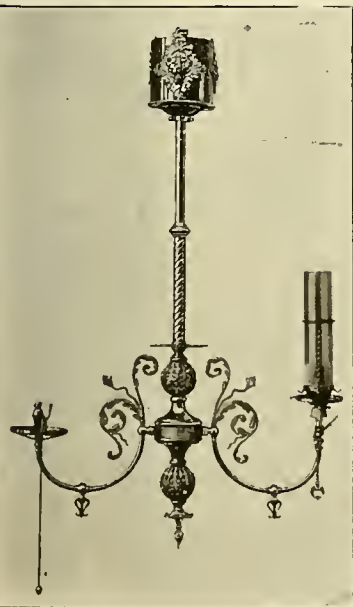
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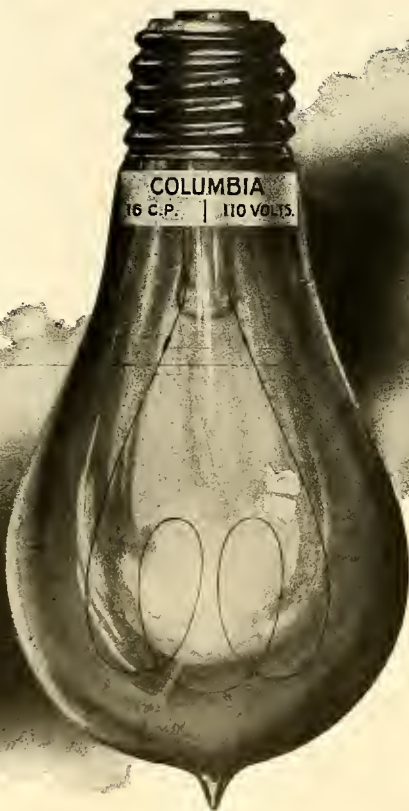
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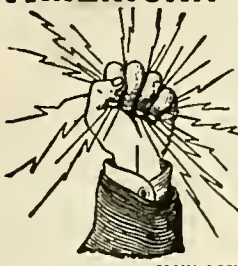
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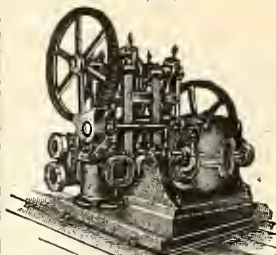
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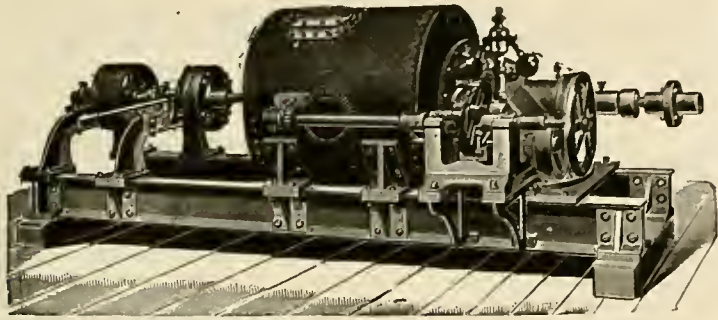
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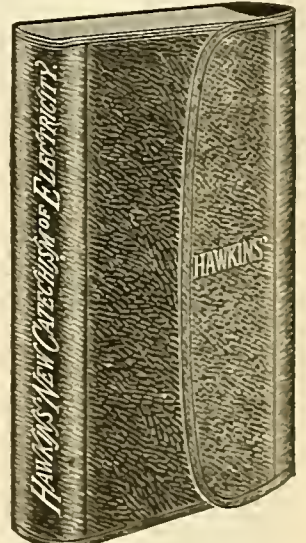
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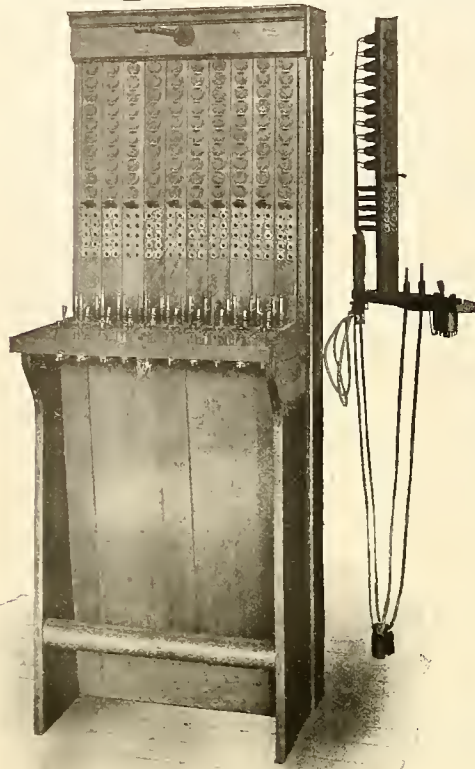
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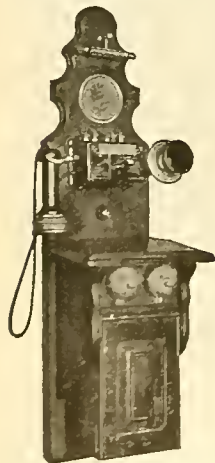
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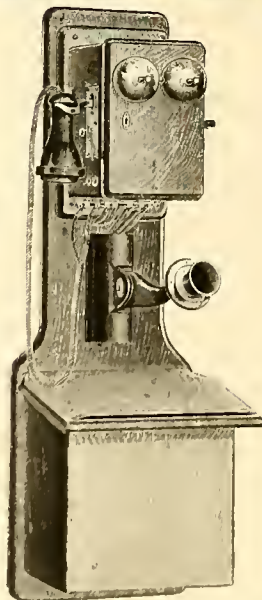
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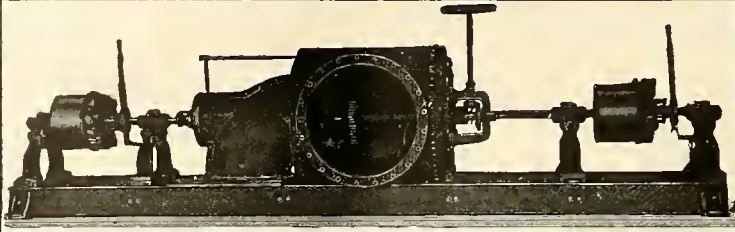
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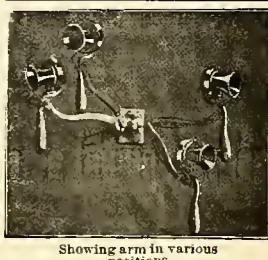
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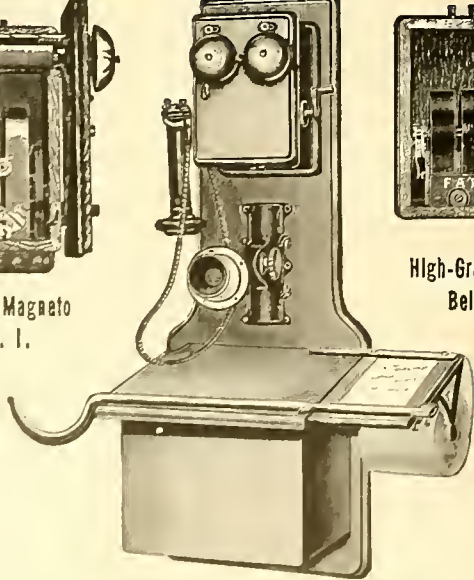
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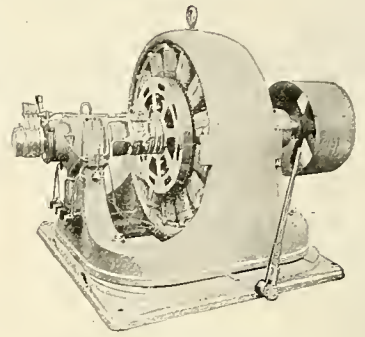
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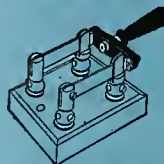
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Western Electrician

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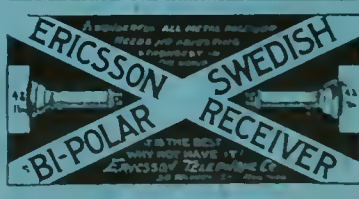
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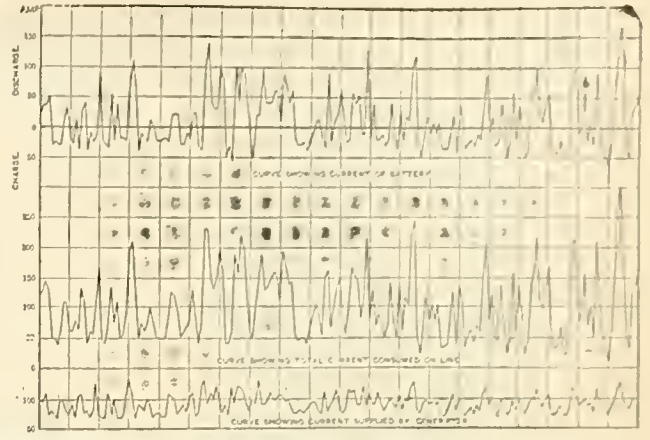
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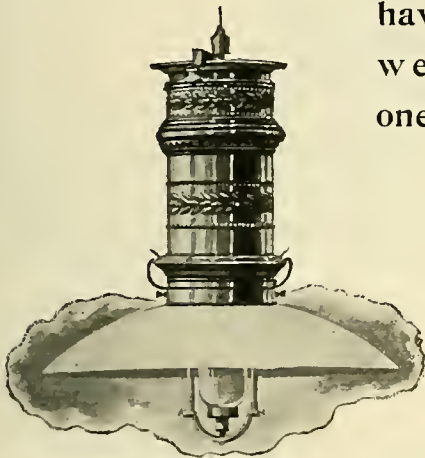
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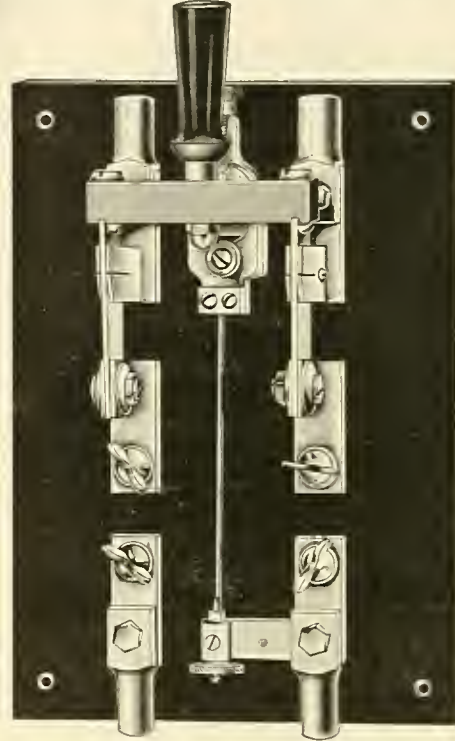


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 1-2 in. x 6 in., 7 in., 7½ in. and 8 in.
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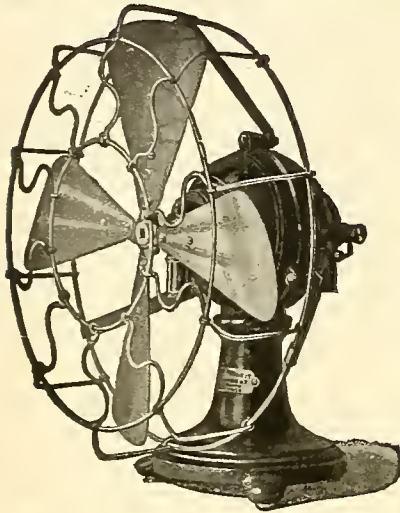
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Diameter. Length.
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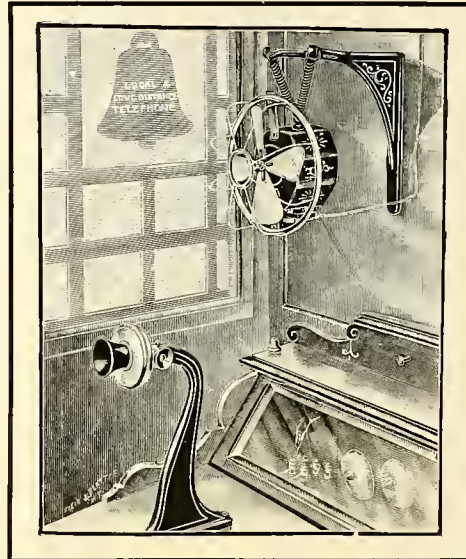
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30% TO 50% SAVED!

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C.-H. RHEOSTATS

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 The Largest Manufacturers of Rheostats in the World.

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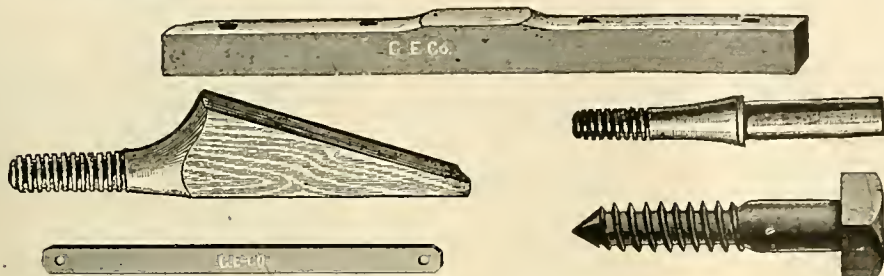
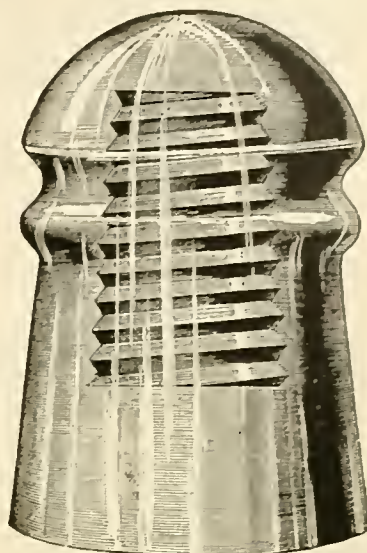
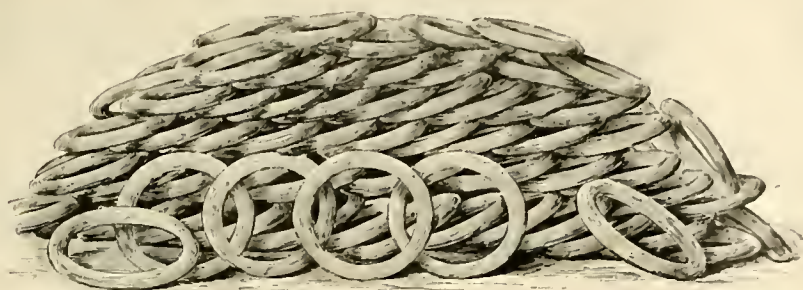
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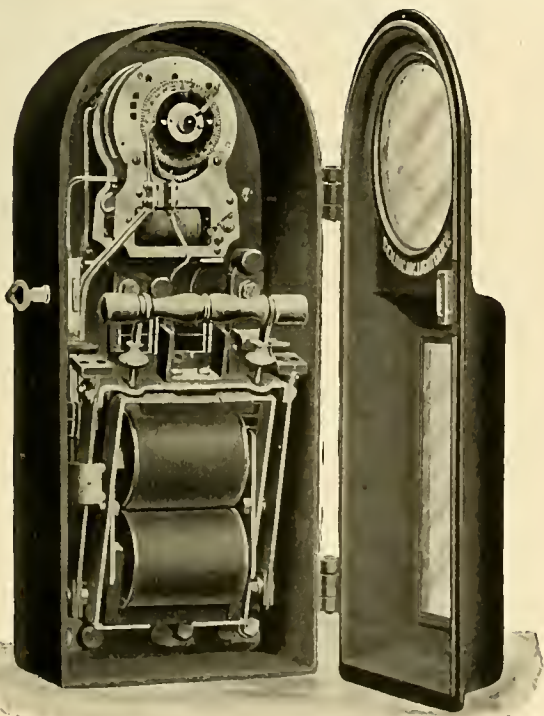
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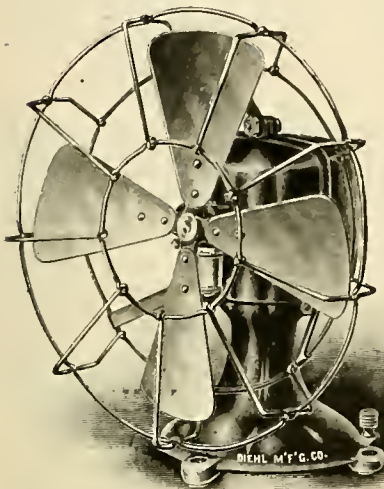
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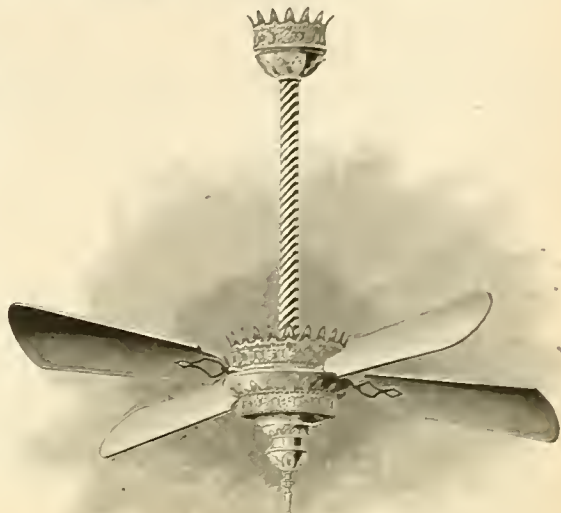
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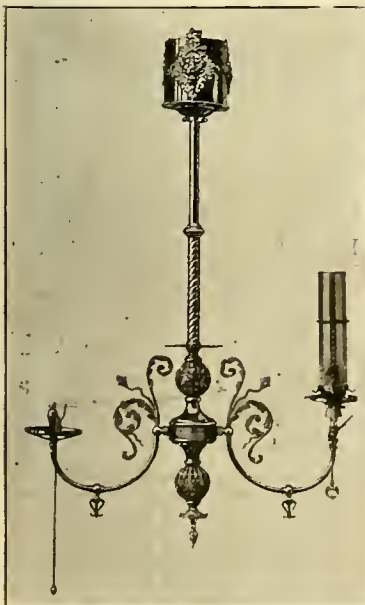
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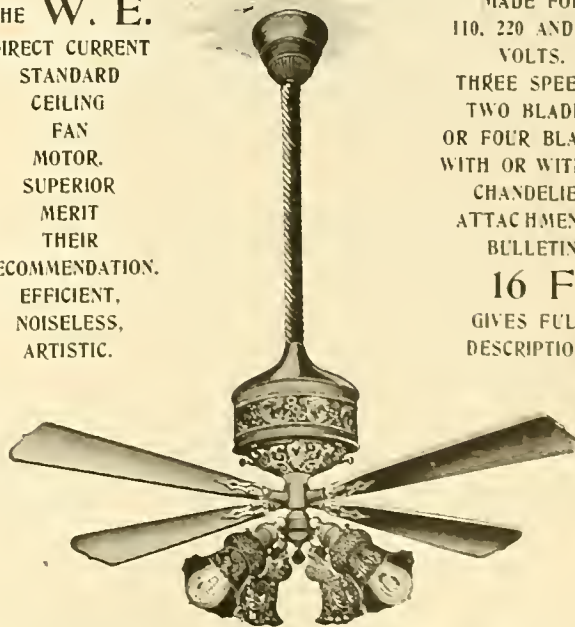
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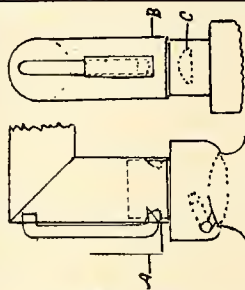
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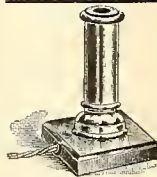
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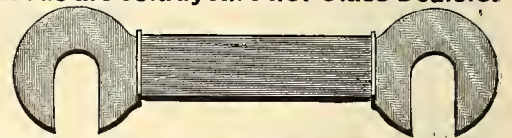
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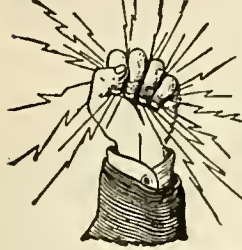
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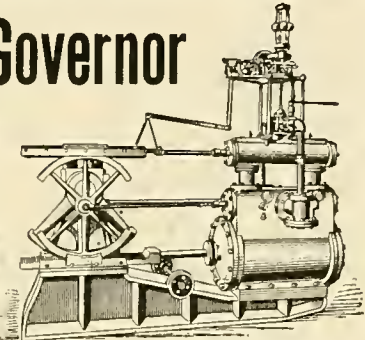
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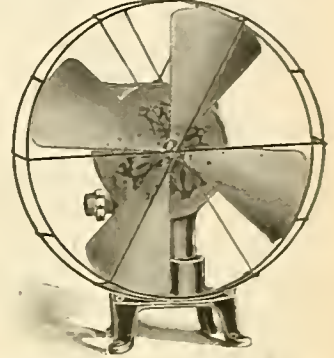
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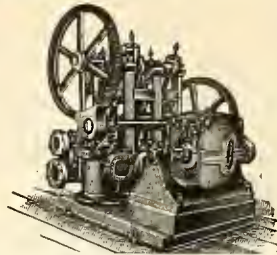
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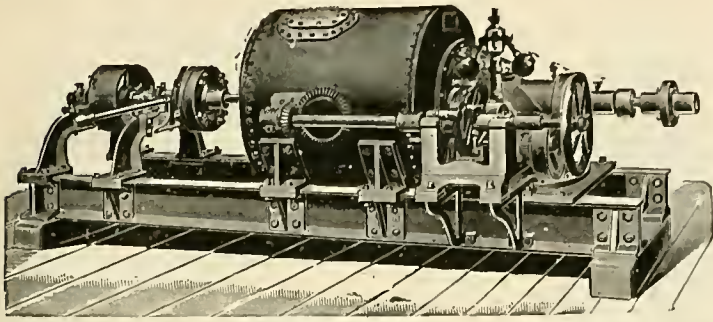
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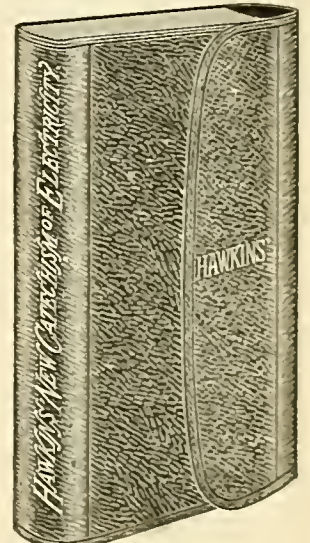
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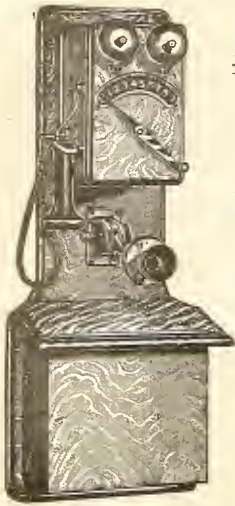
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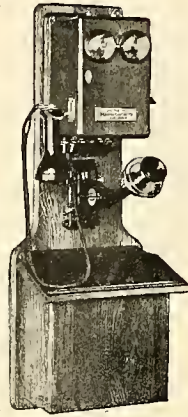
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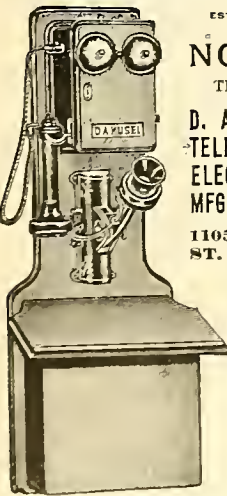
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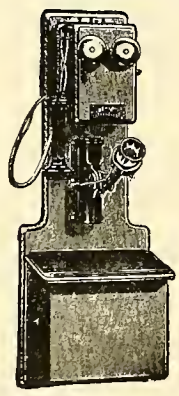
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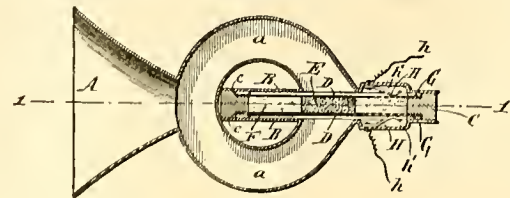
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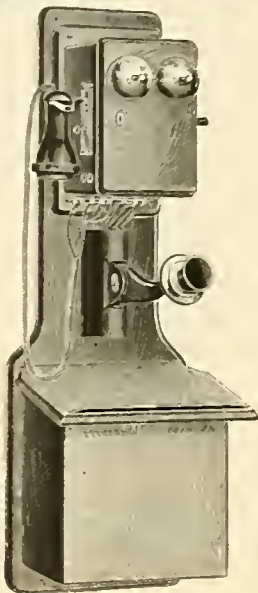
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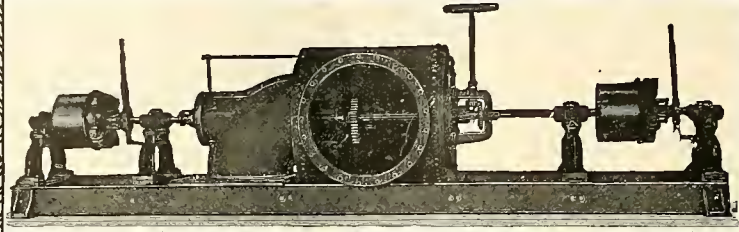
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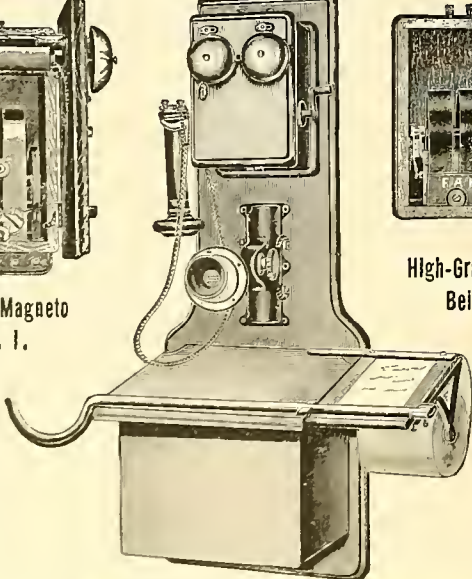
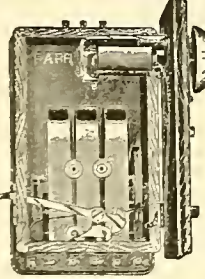
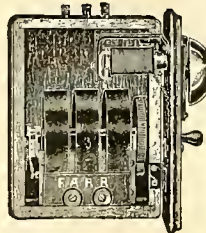
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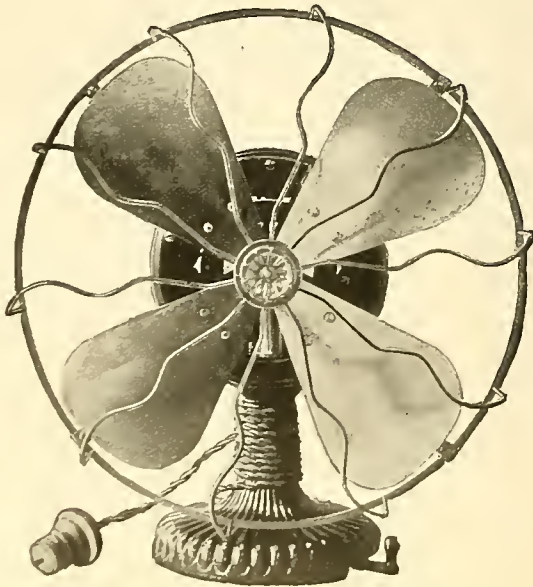
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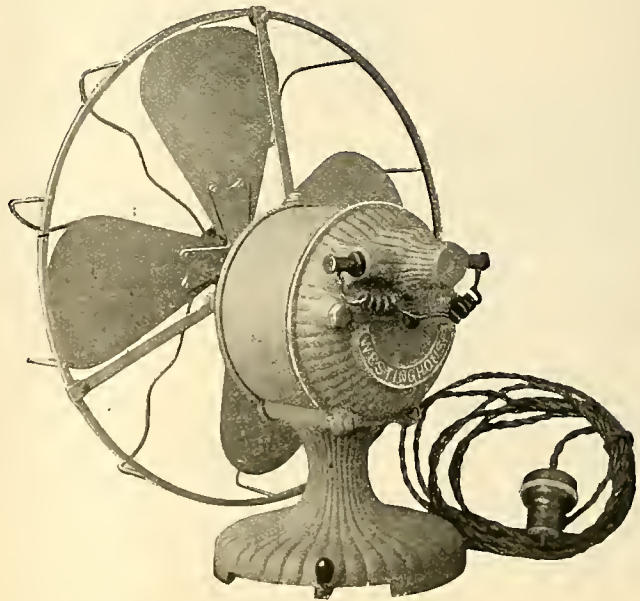
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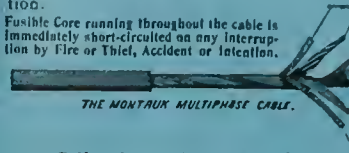
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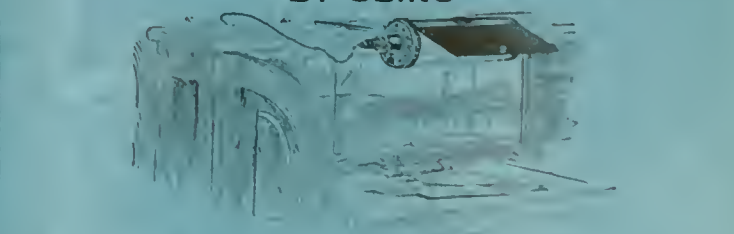
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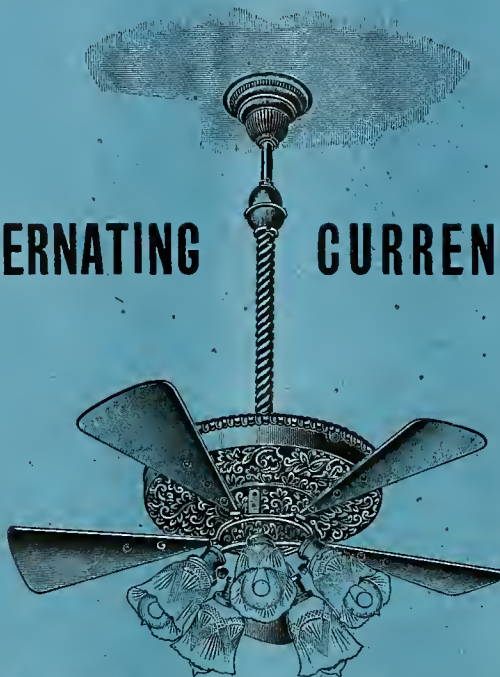
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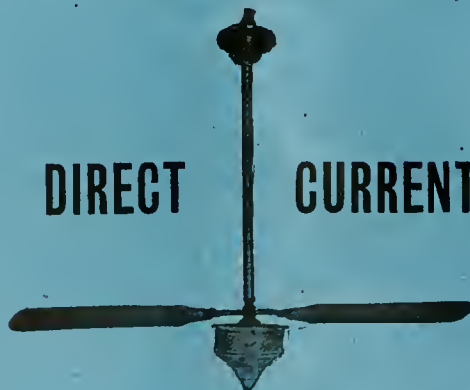
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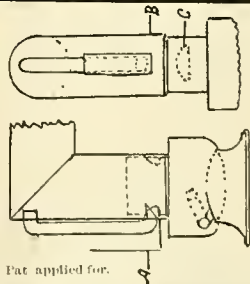
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NEW INTERLOCKING,
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It prevents whistle from
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Send for descriptive circular.

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152-154 Lake St.
CHICAGO, ILL. U.S.A.



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In the West. ELECTRICAL REPAIRS AND MACHINE WORK OF EVERY DESCRIPTION. In having your repair work done by a company operating hundreds of dynamos and motors you are sure of good work and get the benefit of our experience.

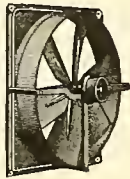
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Than any other
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We manufacture
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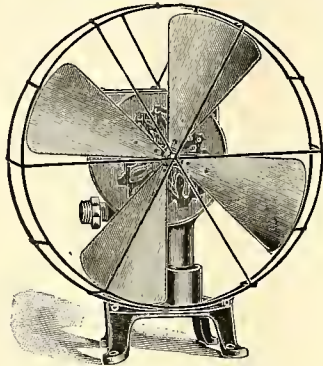
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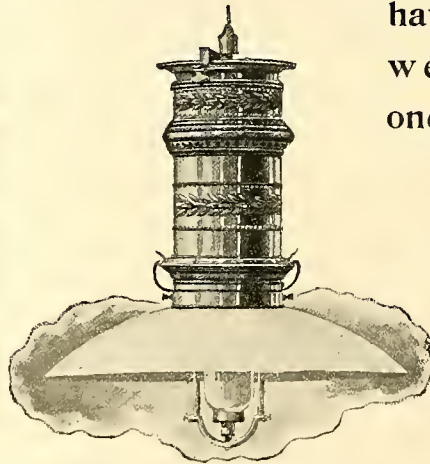
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have characteristic as
well as distinctive
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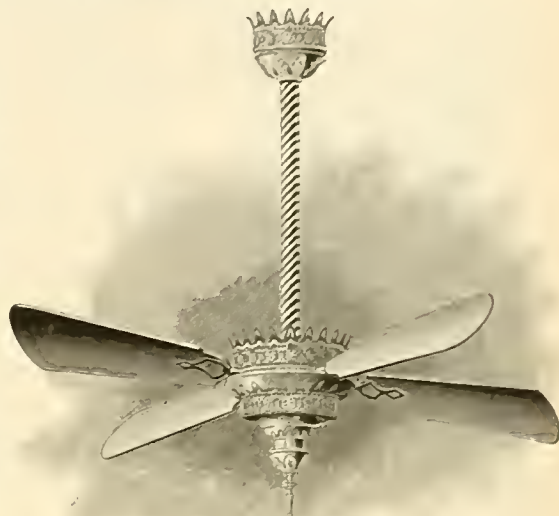
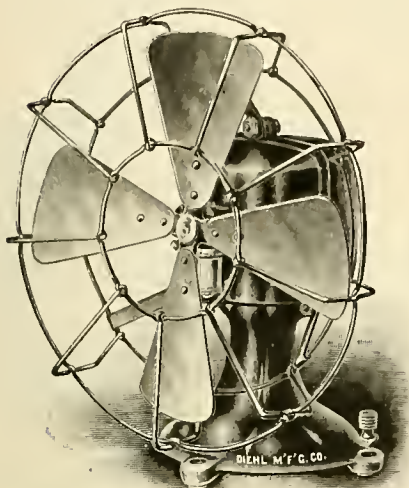
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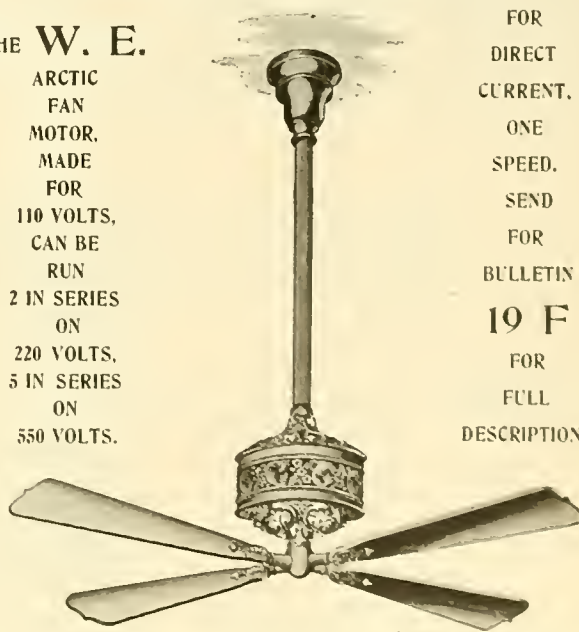
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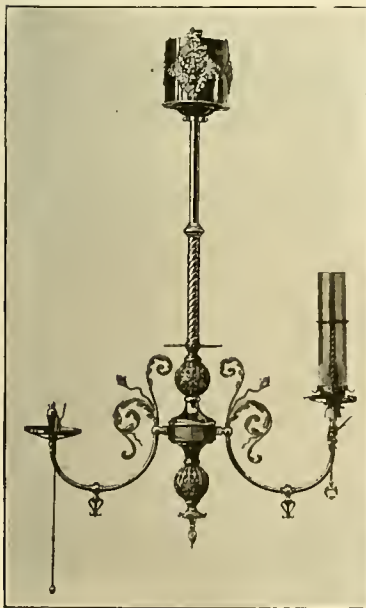
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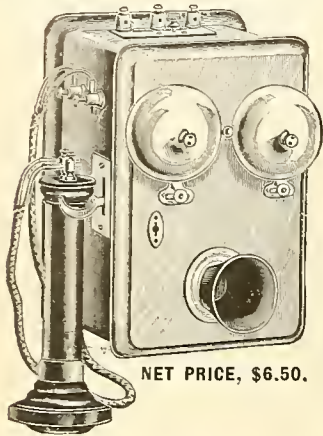
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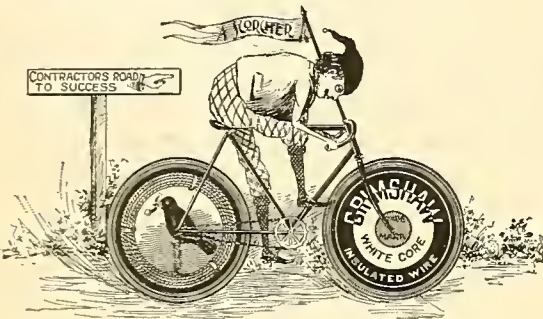
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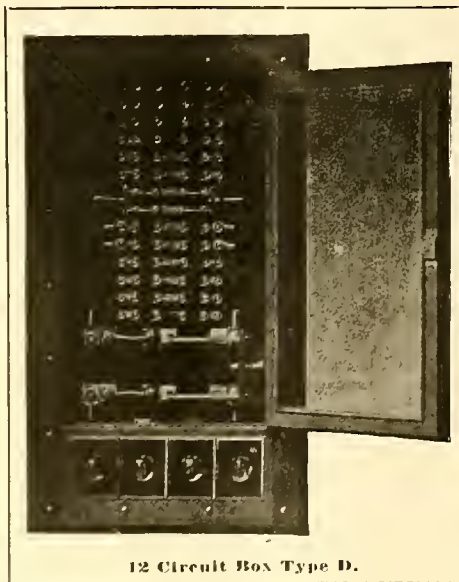
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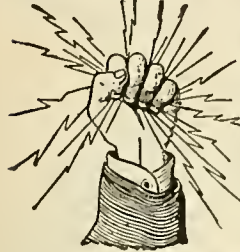
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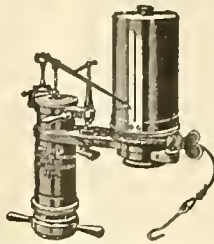
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DISTRICT COURT OF THE UNITED STATES, DISTRICT OF INDIANA.

IN THE MATTER OF THE FORT WAYNE ELECTRIC CORPORATION. No. 7 IN BANKRUPTCY.

Notice is hereby given that, pursuant to an order made and entered on the 30th day of March, 1899, in the above proceedings, the undersigned, as Receivers, will, on the 18th day of April, 1899, between the hours of 10:00 a. m. and 4:00 p. m. of said date, sell at public auction for not less than two-thirds of the appraised value thereof, all the following described property of said bankrupt, to-wit:

The real estate, plant, property, business and good will of said Fort Wayne Electric Corporation, said real estate being more particularly described as follows:

Commencing at a point fifty (50) feet south of the center line of right of way of the Pittsburg, Fort Wayne and Chicago Railway Company, on the east line of the west half northwest quarter section eleven (11), Township thirty (30), Range twelve (12), thence west along the south line of said right of way three hundred and twenty-three and four-tenths (223.4) feet to the east line of Broadway; thence south thirty-one degrees thirty minutes (31°, 30') west along said east line of Broadway, sixty (60) feet; thence south fifty-eight degrees forty-five minutes (58°, 45'), east one hundred and fifty-two (152) feet; thence south thirty-one degrees thirty minutes (31°, 30'), west two hundred and forty (240) feet; thence south fifty-eight degrees forty-five minutes (58°, 45'), east eighty (80) feet; thence south thirty-one degrees thirty minutes (31°, 30'), west thirty (30) feet to the Cemetery line; thence south fifty-eight degrees forty-five minutes (58°, 45'), east one hundred and sixty (160) feet; thence south five degrees thirty minutes (5°, 30'), east one hundred and eleven (111) feet; thence north forty-eight degrees (48°), east three hundred and thirty-four (334) feet; thence north five degrees thirty minutes (5°, 30'), west three hundred and ninety (390) feet to the place of beginning, and containing three and fifteen hundredths (3.15) acres in the City of Fort Wayne, Allen County, State of Indiana.

Also the following described real estate situate in Morrow County, State of Ohio, to-wit:

Commencing at the southwest corner of the depot grounds on the west side of the Cleveland, Cincinnati, Chicago & St. Louis Railroad; thence westerly on said railroad line thirty (30) feet; thence northerly fifty (50) feet; thence easterly thirty (30) feet to the line of the depot grounds; thence southerly along the line of the depot grounds fifty (50) feet to the place of beginning, said land being a part of the land deeded to John McNamara by John Gregory and Louise Gregory on the sixth day of August, 1866, situate in the town or city of Cardington, State of Ohio, Morrow County.

And also all the books, prints, patterns, pictures, blue-prints, drawings and designs used in the buildings on the aforesaid real estate in Indiana and used in connection with the business of said Fort Wayne Electric Corporation, including all the fixtures, machinery, tools, merchandise and personal property of every kind and description, books, papers, contracts and contract records, and interests in patents and inventions, except books of account in the book-keeping department, and notes, bills and accounts receivable, located in the offices and buildings of said Fort Wayne Electric Corporation, together with all property of every kind and description, on consignment or otherwise, situate in any of the towns or cities in the United States, and all property and papers of every kind and description in the branch offices of said Fort Wayne Electric Corporation in the following cities, to-wit:

- Boston, Mass.
New York, N. Y.
Pittsburg, Pa.
Philadelphia, Pa.
Syracuse, N. Y.
St. Paul, Minn.
Chicago, Ill.
St. Louis, Mo.
Cincinnati, O.
San Francisco, Cal.

Free of liens, such sale to be held at the office of the Fort Wayne Electric Corporation, corner of Broadway and the Pittsburg, Fort Wayne & Chicago Railroad in the City of Fort Wayne, Allen County, Indiana; such sale to be continued from day to day at the same place and between the same hours until completed.

TERMS OF SALE.

Twenty (20) per cent. in cash of the purchase price shall be paid at the time of purchase and the balance upon the approval of the sale by the Court. In cash, or at the option of the purchaser in four equal installments, such deferred payments to be payable in three, six, nine and twelve months from the date of sale, with five per cent. interest per annum thereon, and evidenced by notes of the purchaser; the title, however, to the property so sold by the undersigned to be and remain in the control of said District Court of the United States for the District of Indiana until said deferred payments with interest are fully paid, with the right reserved and vested in said Court to retake said property and resell the same upon default in the payment of any such deferred payments, such condition to be inserted in the notes executed by the purchaser and also in the deed to be delivered on the order of the Court.

Notice is further given that, by the order of said Court the mortgage of the General Electric Company on a portion of the aforesaid real estate is assigned to me a first and valid lien upon the aforesaid real estate in Indiana, the buildings thereon and all machinery, tools, patterns, drawings, furniture and fixtures situated in or about the aforesaid buildings and offices on July 16, 1897, and which belonged on that date to the Fort Wayne Electric Light Company to the amount of One Hundred and Eighty-Five Thousand Dollars (\$185,000), with the power to said General Electric Company, in case of its selling a purchaser at such sale of said property in payment of its purchase the balance of said indebtedness, and secured by said mortgage to the extent of One Hundred and Eighty-Five Thousand Dollars (\$185,000).

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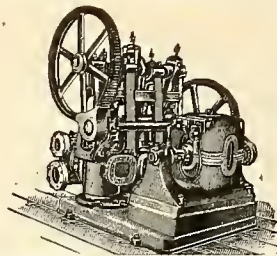
Good salary or commission will be paid salesman, if ability is demonstrated; must be acquainted with the electrical supply business, know the trade in eastern and middle states and be capable of getting business at reasonable expense. Apply, stating age, years of experience, line have sold, where best acquainted. "Manufacturer," care Western Electrician, 510 Marquette Building, Chicago.

WANTED.

RELIABLE AGENTS to sell our line of DIRECT-CURRENT DYNAMOS and MOTORS. Address, for full information, Eagle Electric Works, Peoria, Ill.

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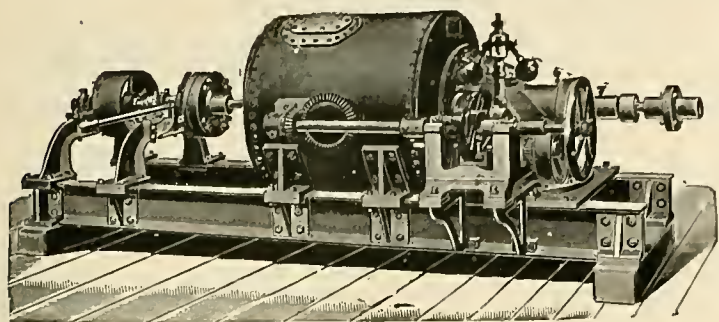
If you have any Old Copper Wire of any description to dispose of, it will pay you to communicate with us, as we are 2 1/2 all times in the market for any quantity of Scrap Copper Wire, at the highest market values. We pay cash and send prompt returns. We are also supplying the electrical trade with our high grade Babbitt, Cotton Waste, Solder, Etc. Please communicate with us.

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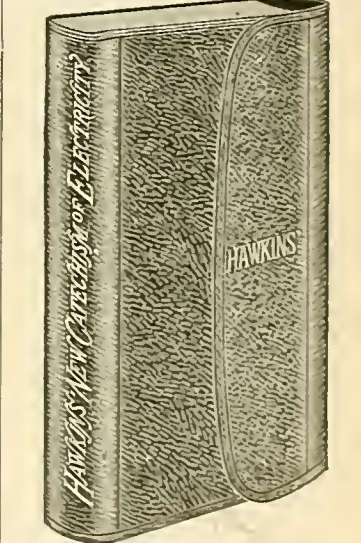
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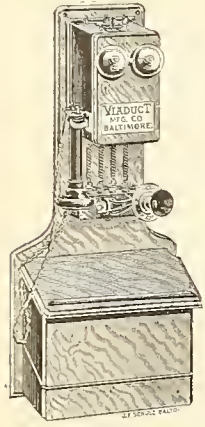
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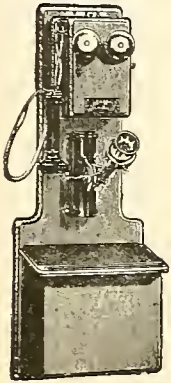
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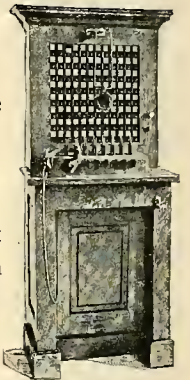
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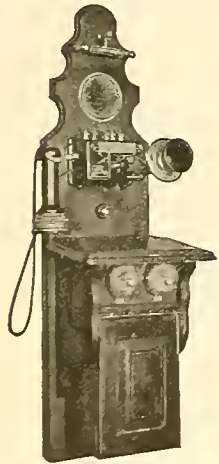
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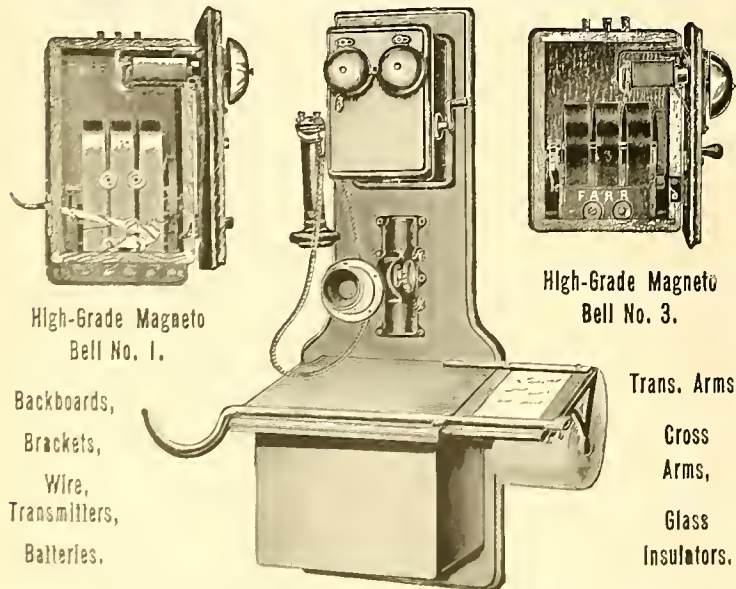
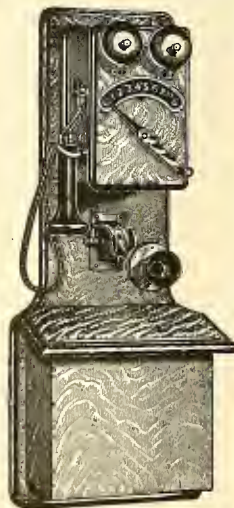
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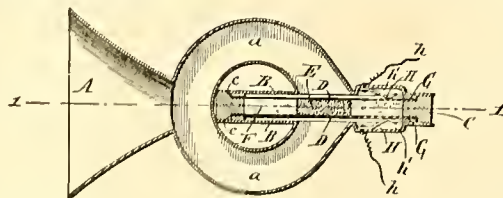
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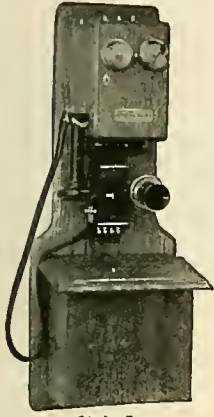
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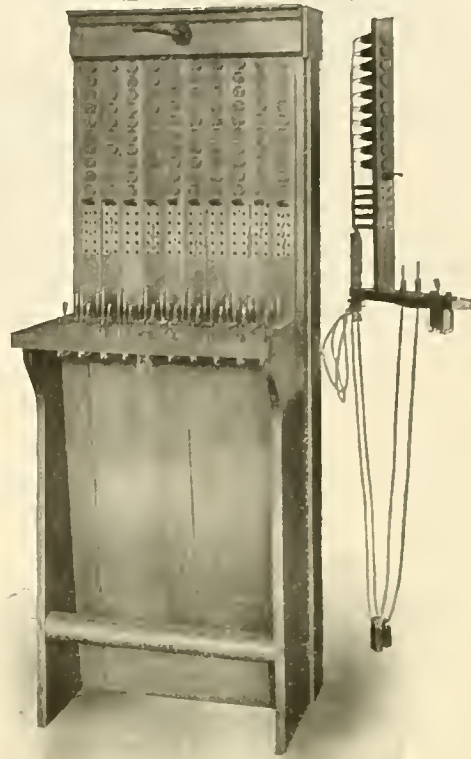
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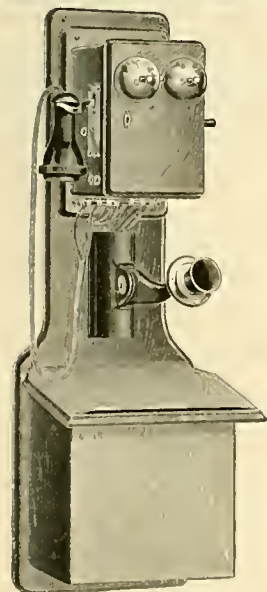
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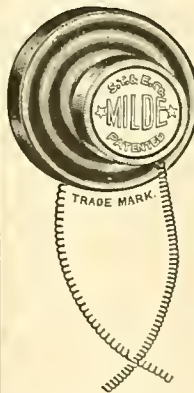
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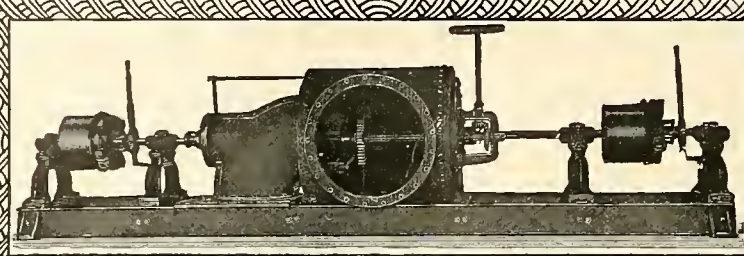
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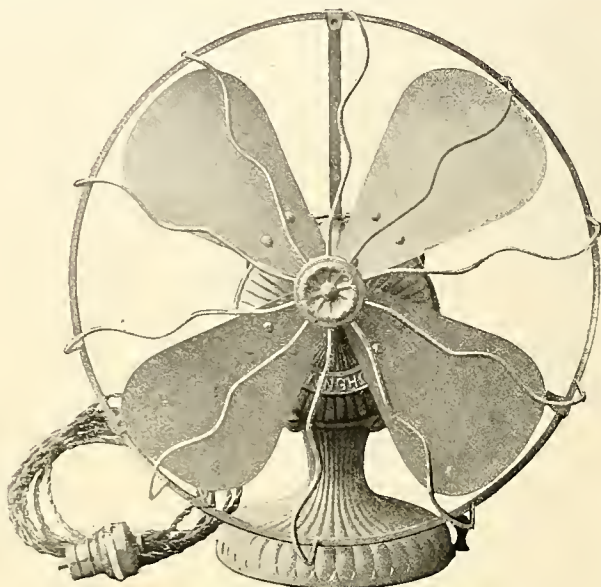
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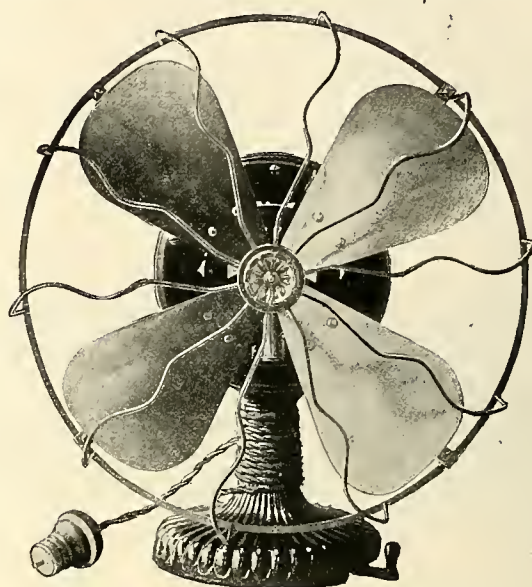
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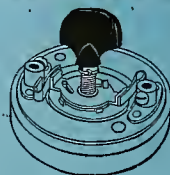
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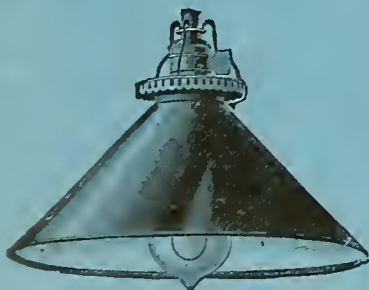
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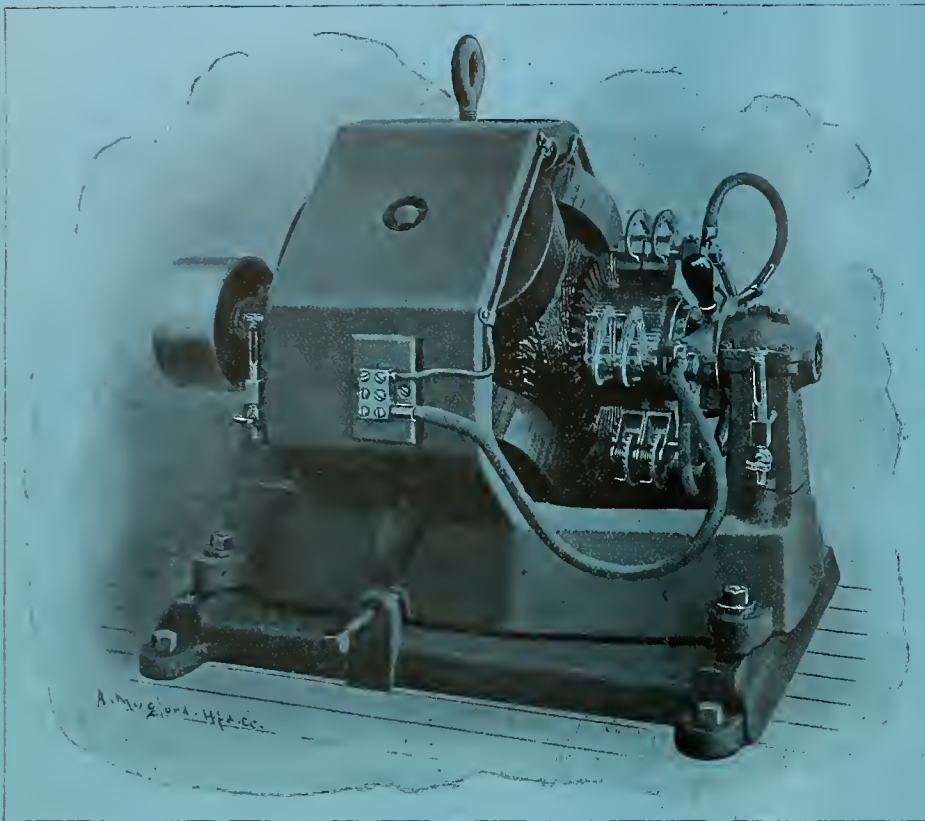
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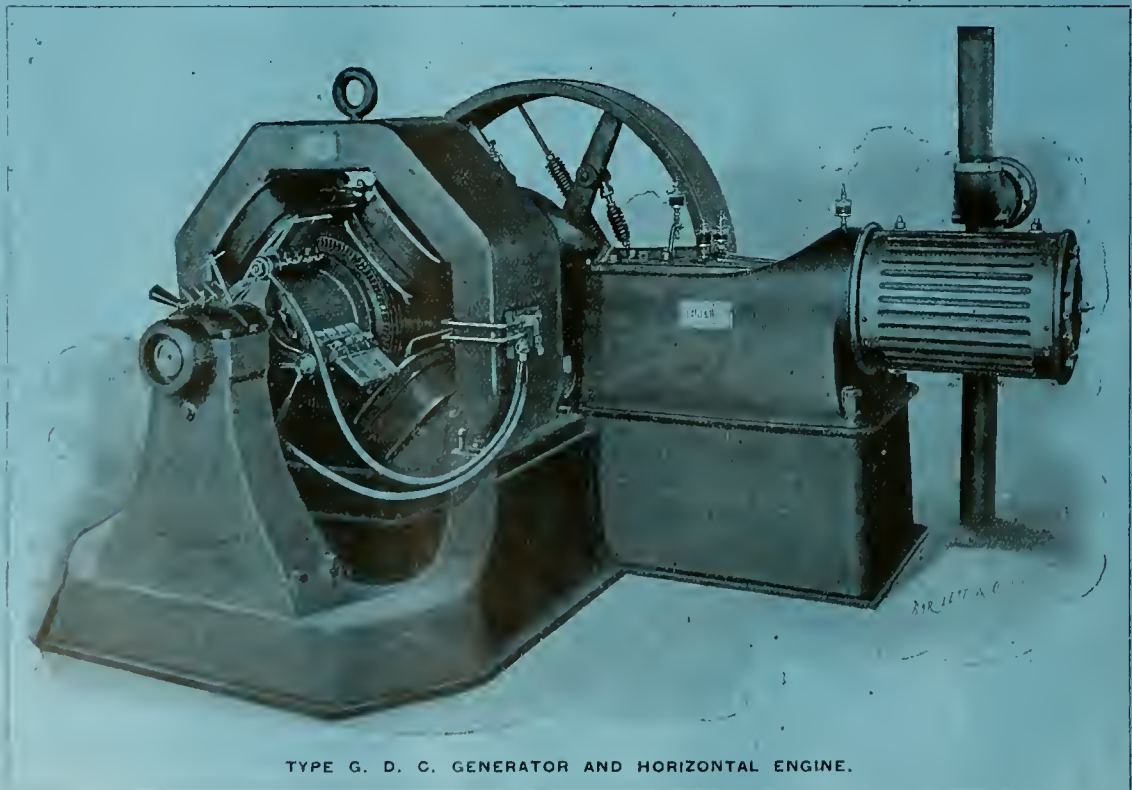
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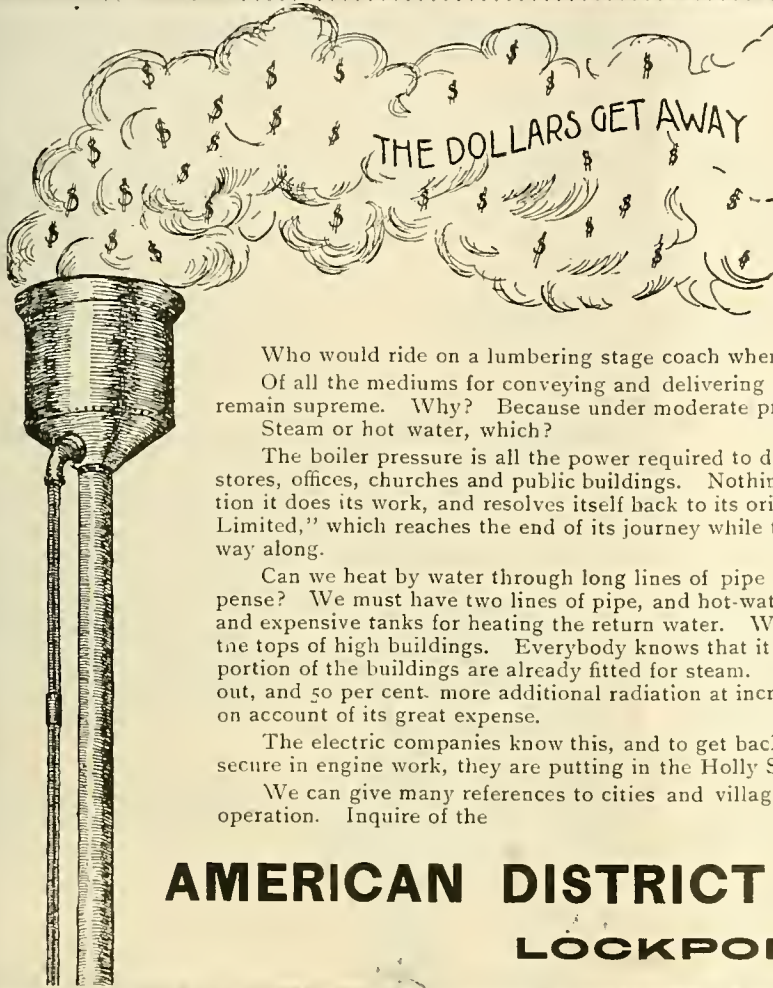
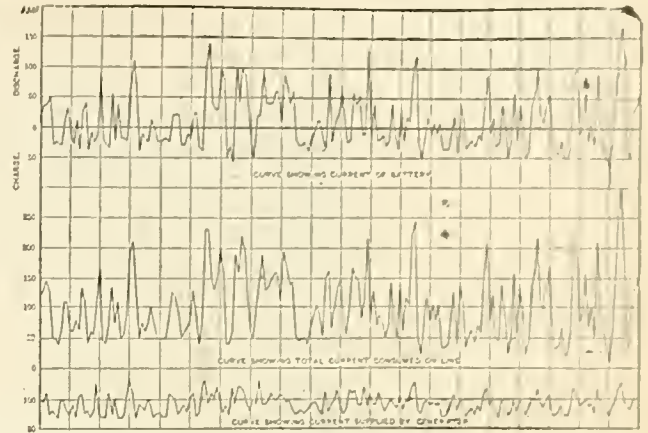
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We can give many references to cities and villages that have this system in practical and successful operation. Inquire of the

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FOR DIRECT CURRENT ARC LAMPS.

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5-16 in. x 6 in., 6½ in., 7 in., 7½ in. and 8 in.

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1-2 in. x 6 in., 7 in., 7½ in. and 8 in.

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SOLID CARBONS.

Diameter. Length.

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Having received a large consignment of these Carbons just before the new tariff went into effect, we are prepared to make very low prices. Send for price list.

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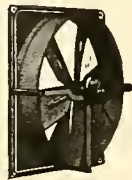
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TRIUMPH EXHAUST FAN.

Guaranteed to move

Only Successful

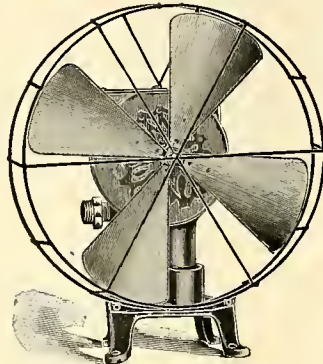
More Air, Dust, Heat, Steam, Etc., With Less Power Than any other Fan.



Water Blow Fan. Files have no use for them. Attractive, Efficient, Durable, Most Economical Water Consumption.

JUNIOR WATER BLOW FAN.

State Water Pressure.



Pat. Applied for. Price \$7.50.

Send for Catalog X.

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Every electrician should be supplied with a bottle.

Sold by druggists or mailed prepaid on receipt of price.

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Send for free booklet, "Vitogen in Practice."

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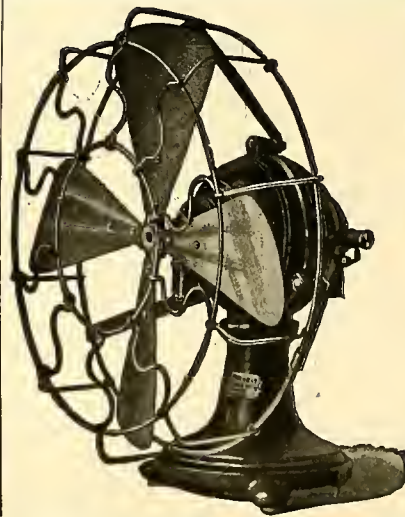
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For Ceiling or Desk - A Written Guarantee with each Fan.

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ALWAYS the BEST.

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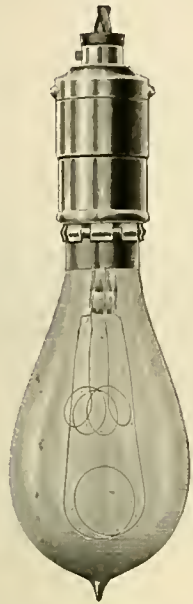
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Monadnock Building, Chicago.

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Truitt Regulating Lamp.



**EFFICIENT and
ECONOMICAL.**

No waste of current by resistance or induction.

Simply turning lamp in socket will produce 1, 8, 16 or 24 candle power illumination, as may be desired.

Nothing unsightly, for it is precisely the same size as an ordinary socket and 16 c. p. lamp.

Works equally as well on direct and alternating currents.

**PRICE BUT LITTLE
IN EXCESS OF
ORDINARY LAMP AND
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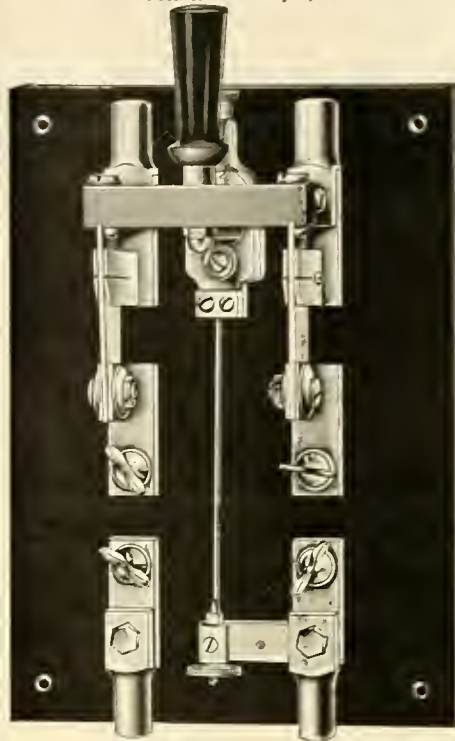
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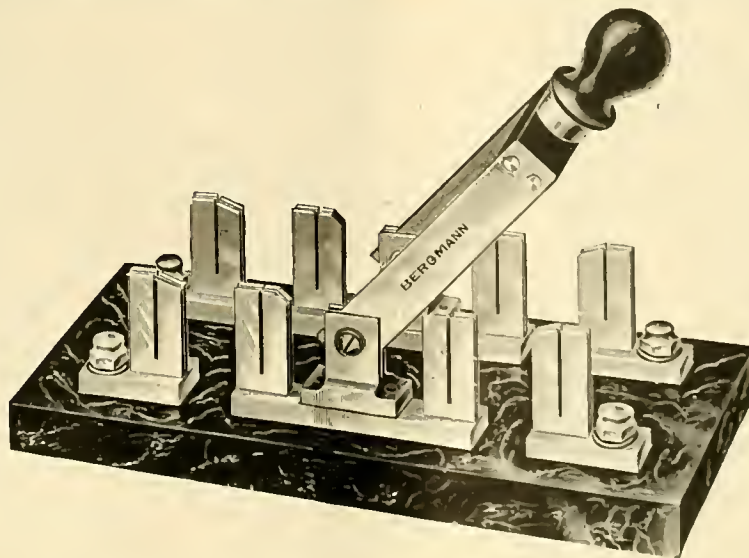
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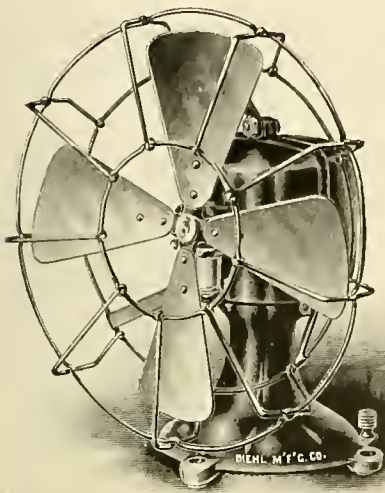
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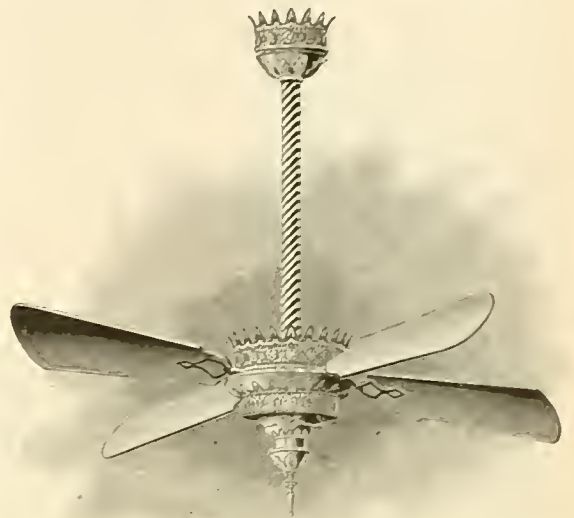
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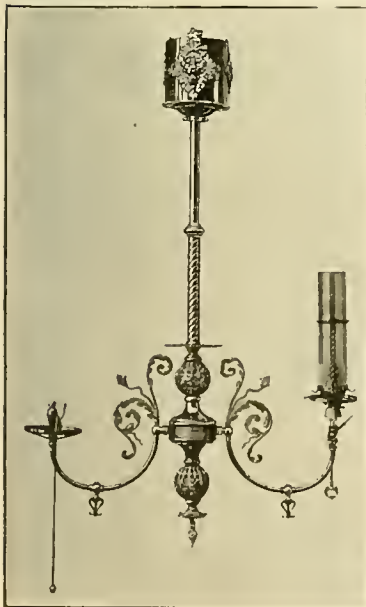
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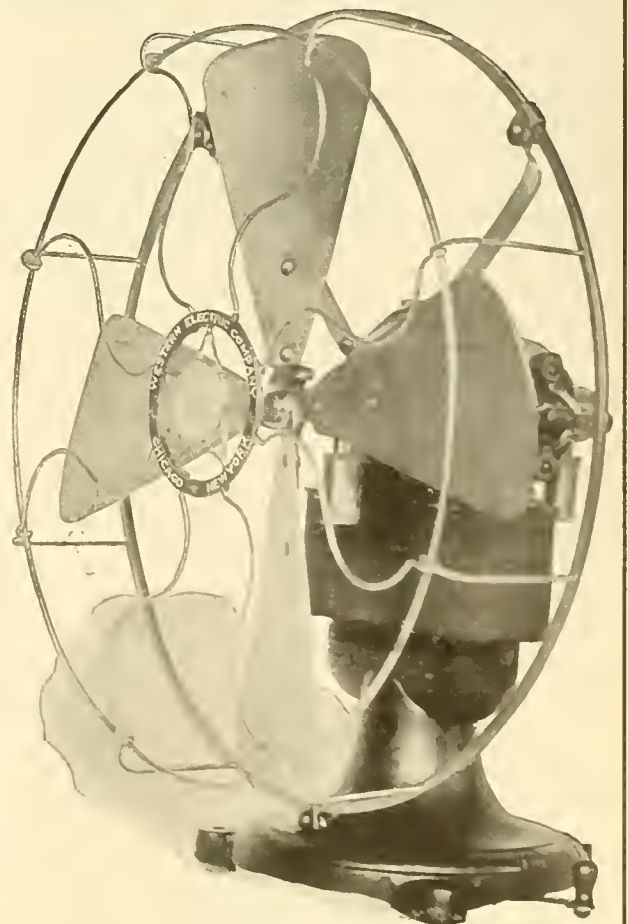
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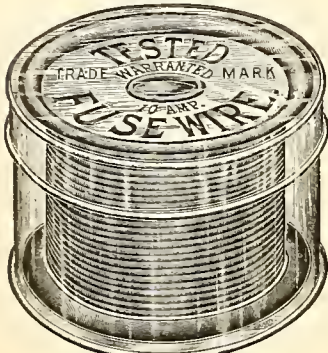
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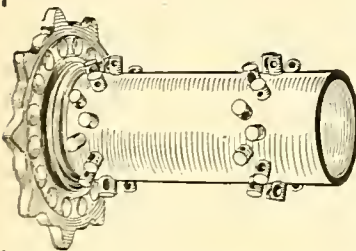
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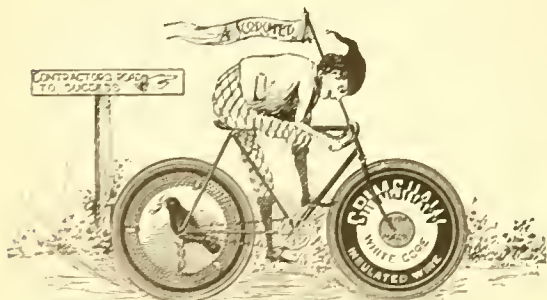
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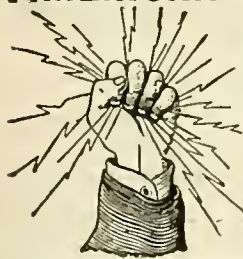
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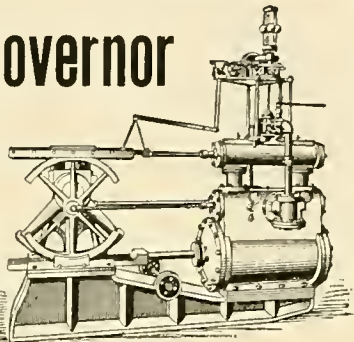
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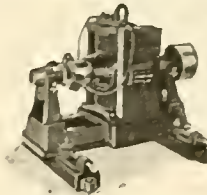
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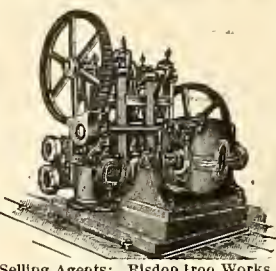
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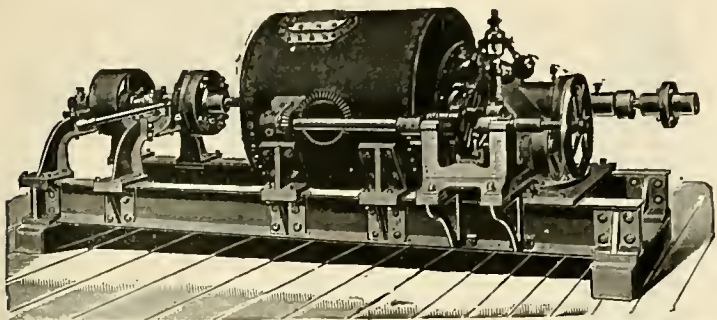
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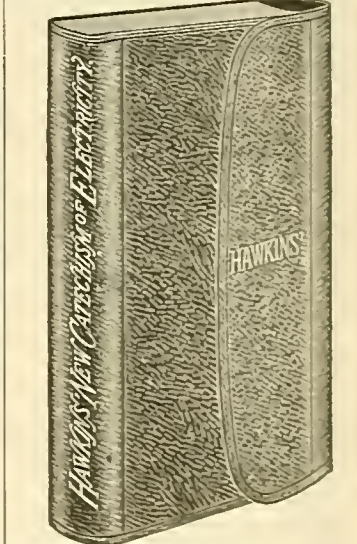
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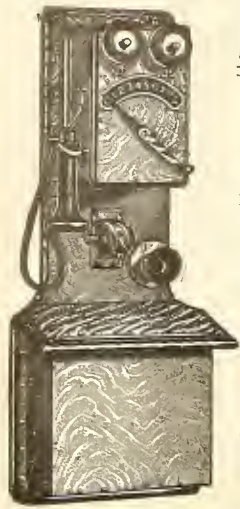
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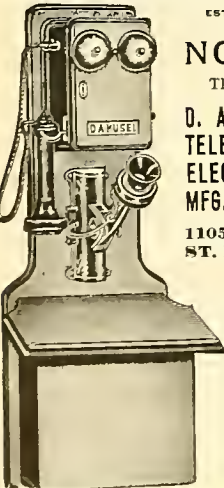
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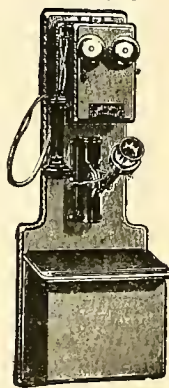
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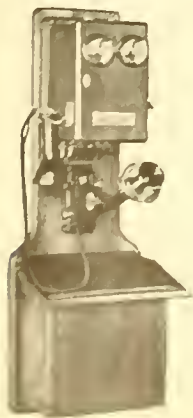
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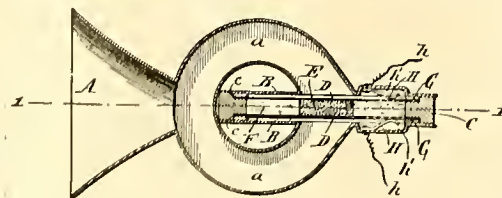
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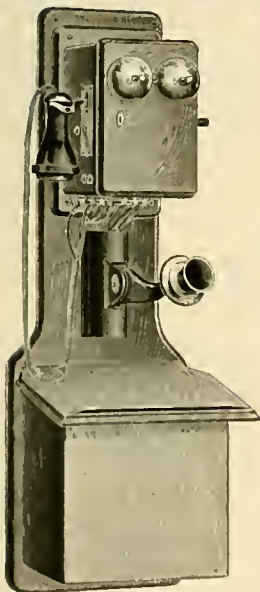
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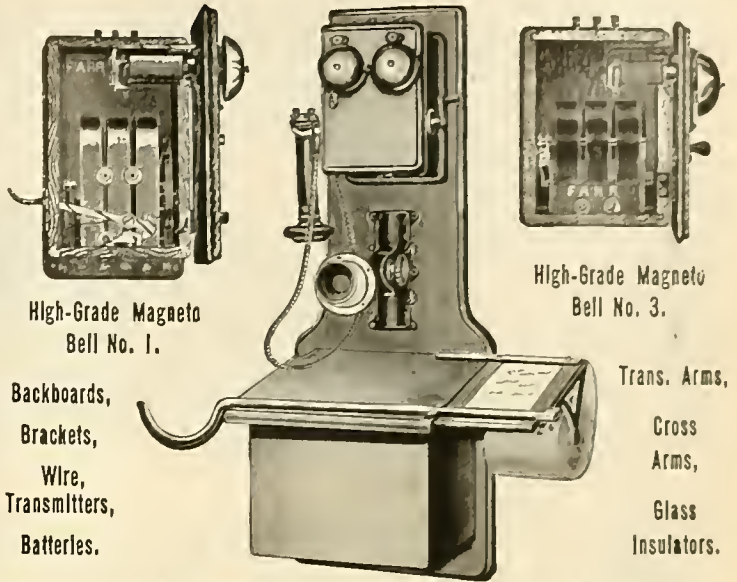
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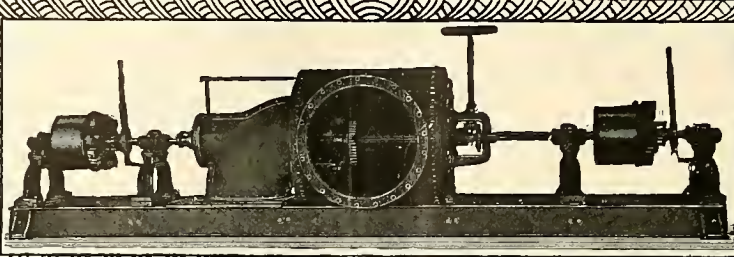
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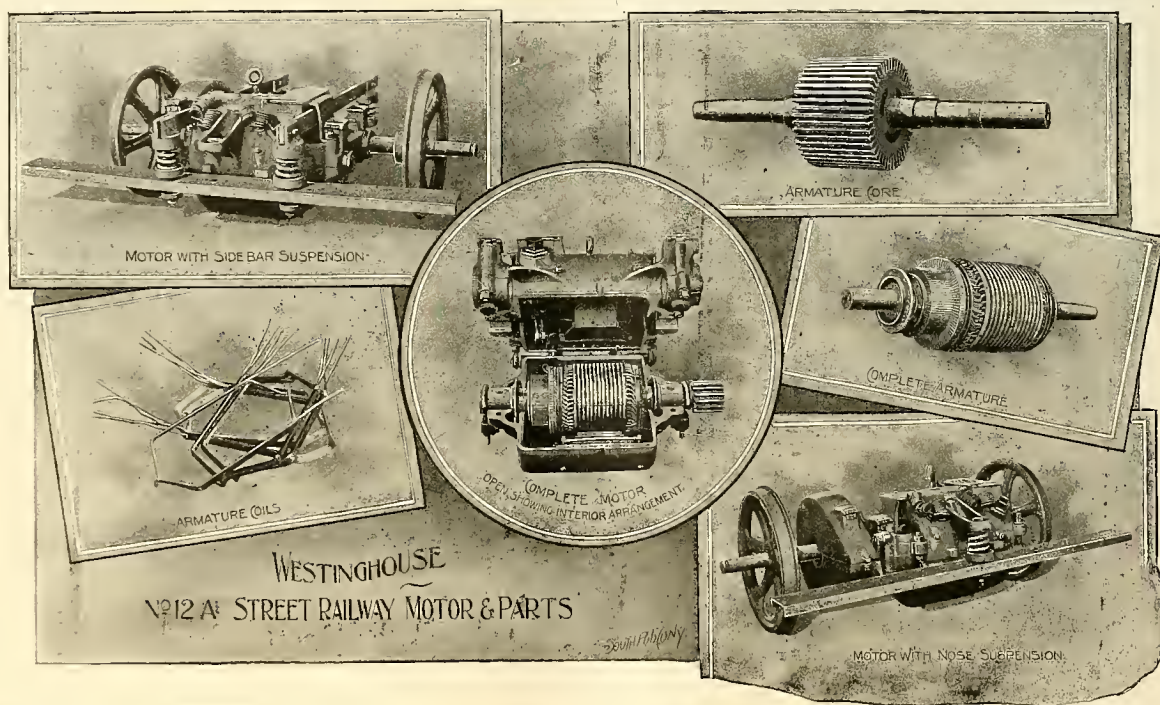
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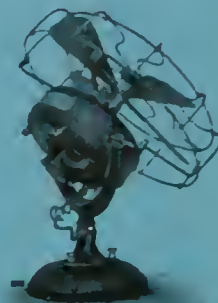
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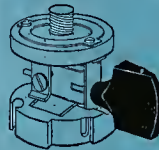
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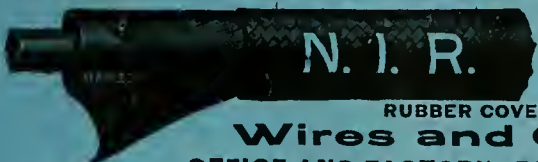
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Acme Testing Sets, Queen-Wirt Switchboard Instruments, X-Ray Focus Tubes, Induction Coils.

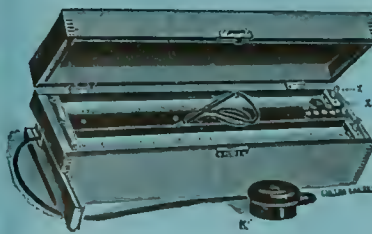
Foré Bain, Consulting Engineer, Electricity, Mechanics, Solicitor of Patents. Expert in patent causes. Suite 1657-59 Monodnock Bldg., Chicago.

ERICSSON SWEDISH BI-POLAR RECEIVER. A MODERN FOR ALL METAL RECEIVERS. NEEDS NO ADJUSTING. IS PERFECT IN EVERY PARTICULAR. IT IS THE BEST WHY NOT HAVE IT? **ERICSSON TELEPHONE CO.**

30% TO 50% SAVED!

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The Direct Reading Ohmmeter

WILL ACCURATELY MEASURE RESISTANCE ON A RAPIDLY MOVING ELECTRIC CAR.

No other instrument can meet such difficulties of stray magnetism and vibration. A boy can use it. The brains are in the box.

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The KINSMAN DESK LAMP

Which is the only fixture made that will properly light a roll-top desk and at the same time shield the eyes. Beware of the numerous cheap imitations in the market.

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All genuine "ELECTRA" carbons are put up in packages bearing the label with the trade mark "ELECTRA."

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All the excellence in dynamos and arc lamps counts for but little where poor carbons are used in lamps.

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New device for lighting in series, in churches, theaters, etc. Simple, sure and cheap. Send for circulars and prices.

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Only Successful

More Air, Dust, Heat, Steam, Etc., With Less Power Than any other Fan.

We manufacture all kinds of Fans, also Water Motors.



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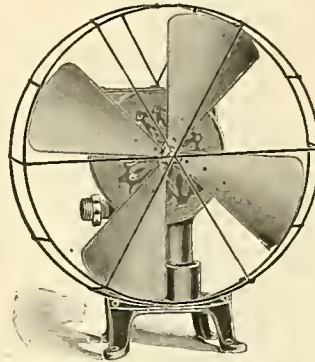
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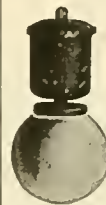
JUNIOR WATER BLOW FAN.

State Water Pressure.



Pat. Applied for. Price \$7.50.

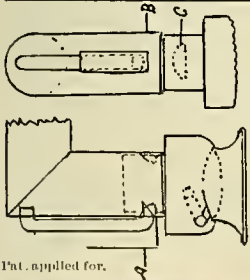
LEA ENCLOSED ARC LAMPS.



Single Lamps for..... 500 Volt Circuits 220 110

They have few parts, regulate perfectly, are graceful in design, and the price is right. Won't you let us tell you about them?

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H. A. PAQUETTE & CO.,

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SPEAKING TUBE.

It prevents whistle from falling off. For Sale By Electrical Supply Houses and Hardware Dealers.

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MANUFACTURERS OF THE

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CHICAGO INSULATED WIRE CO. 152-154 Lake St. CHICAGO, ILL. U.S.A.

ALPHABETICAL INDEX OF ADVERTISEMENTS.

Table listing various companies and their page numbers, including Aaron Electric Co., Advance Specialty Co., Allen-Husay Co., American Battery Co., American El. Heater Co., Amer. El. Specialty Co., American Elec. Tel. Co., American El. Vehicle Co., American Elec. Works, Amer. Reflect. & Lig. Co., Amer. School of C. Resp., Baldwin, Foran, Baker & Co., Ball Engine Co., Barnett Co., Bates & Bro., Becken, Becker Name Plate Co., Berthold & Jennings, Seely & Co., Bogart Co., Hossart El. Coat, Brady, T. H., Brown & Co., Bryan & Humphrey, Buckeye Electric Co., Bunnell & Co., Cury Spring Works, Cass & Co., Central Electric Co., Central Mfg. Co., Chicago Edison Co., Cible, Fuse Wire & Mf. Co., Chicago Ins. Wire Co., C. M. & St. P. R. R., Chicago Rheostat Co., Cling-Surface Mfg. Co., Cooper & Co., Cutler-Hammar Mfg. Co., Cutter El. & Mfg. Co., Dayton Globe Ir. Wk. Co., Dearborn Drug & Ch. Co., Delaware Hard Fibre Co., Diehl Mfg. Co., Dixon Crucible Co., Eagle Electric Works, Eastern Elec. Cable Co., Eddy Electric Mfg. Co., Edison Lamp Dept., Edison, Thomas A., Jr., El. Eng. Inst., Corr. Inst., Elec. Appliance Co., Electrical Exhibition Co., Electric Storage Batt. Co., Electrician Pub. Co., Emerson El. Mfg. Co., Erbeson Telephone Co., Eureka Elec. Co., Farr Tel. & Cons. Sup. Co., Fischer Equipment Co., "For Sale" Advs., Fort Wayne El. Corp., Ft. Wayne Inc. Lamp Co., Carlton-Daniels Elec. Co., General Electric Co., Gen'l Inc. Arc Light Co., Glucose Sugar Ref. Co., Goldsmith Bros., Gordon, A. Y., Harvey Co., Hatch Storage Battery Co., Hedge-Walsh El. Eng. Co., Holmes Fibre-Graph. Co., Holyoke & Holyoke, Huebel & Manger, Illinois Electric Co., Incandescent Electric Light Manipulator Co., Internat'l Cor. Schools, Kartsvert Mfg. Co., Kester Electric Co., Klein & Son, Mathias, Kokomo Tel. & El. M. Co., Kuhlman Electric Co., Kusel, D. A., Tel. & Elec. Mfg. Co., Lea Mfg. Co., Leather Preserver M. Corp., Leclanoh Battery Co., Letell & Co., James, Leschen-Macomber-Whyle Co., Lindsley Bros., Lombard Water Wb. G. Co., Lynn Inc. Lamp Co., Manhattan Elec. Sup. Co., Mass. Chemical Co., Matthews, W. N., Mayer, M. M., Elec. Co., McCarthy Bros. & Ford., McIntyre, Elmer E., McLennan & Co., McLeod, Ward & Co., Mica Insulator Co., Miller, Kempster B., Miscellaneous Advs., Monon R., Montauk Multip. Cable Co., Morris Arc Lamp Co., Munsell & Co., Eugene., National Auto. Tel. Co., National India Rubber Co., New York Insul. Wire Co., Noblett, E. J., North Electric Co., Ohio El. Spec. Mfg. Co., Okonite Co., Palto Co., H. T., Paquette & Co., H. A., Paragon Fan & Motor Co., Peerless Rubber Mfg. Co., Pelton Water Wheel Co., Perrizo & Sons, Peru Elec. Mfg. Co., Phillips Ins'd. Wire Co., Phoenix Glass Co., Phosphor-Bronze S. Co., Queen & Co., Rawson Electric Co., Sargent & Lundy, Sawyer-Man Electric Co., Schoonmaker, A. O., Schwalm Co., Geo. F., S. E. I. Co., Shelby Electric Co., Shultz Bolting Co., Simplex Electrical Co., The, Specialty Mfg. Co., Standard Paint Co., Standard Tel. & El. Co., Standard Underg. Cable Co., Sterling Electric Co., Sterling Varnish Co., The, Stowers Electrical Co., Stillwell-Bierce & Smith-Yalle Co., Stow Mfg. Co., Stromberg-Carlson Tel. Mfg. Co., Swarts Metal Refin'g Co., Technical Agency, Torrey Cedar Co., United Elec. Imp. Co., Verney & McQuay, Victor Electric Co., Victor Telephone Mfg. Co., Vulcanized Fibre Co., Wagner El. Mfg. Co., Walsh's Sons & Co., Warren Elec. Mfg. Co., Western Electric Co., Western Elec. Supply Co., Western Tel. Cons. Co., Westinghouse Electric & Manufacturing Co., Weston Electrical Inst. Co., Wilhelm Tel. Mfg. Co., Williams Electric Co., Worcester & Co., O. H., Wright Discount Meter Co., Wyckoff Crosscutting Co.

For Classified Index of Advertisements See Page VI.

We have the Largest and Most Complete Electrical

REPAIR SHOPS

In the West. ELECTRICAL REPAIRS AND MACHINE WORK OF EVERY DESCRIPTION. In having your repair work done by a company operating hundreds of dynamos and motors you are sure of good work and get the benefit of our experience.

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ABSOLUTE SAFETY

IS ASSURED ALL USERS OF

McINTYRE'S

Portable Electric Safety Lamp.



This is an Electric Lamp set in a White Enamelled Parabolic Reflector, and can be attached to the cap or any part of the clothing by means of a stick pin attached to reflector and connected to the battery with a flexible cord. The battery is arranged to be carried on a belt or in the pocket, so the user has free use of hands. The current can be turned off when not in use.

Dry Batteries are used and can be recharged from direct incandescent electric current. Charger and full directions go with each lamp.

IS USED BY THE FOLLOWING:

For Watchmen, Miners, Mine and Gas Inspectors, Boiler Shops, Oil and Gas Works and Gas Fitters, City Sewer and Underground Cable Inspectors; Powder Mills and Warehouses where explosive materials are manufactured and stored; exploring cellars and trenches where leaks occur and investigating pipe connections where it is impossible to carry an oil lamp or candle for fear of explosion—and all parties requiring a safe, portable light. The whole outfit is neat and compact.

No. 1 Weighs 2 lbs. 1 1/2 C. P. Price complete, \$ 4.00. For meter reading only.
" 2 " 3 " 4 " " " 6.00. For general use.
" 3 " 12 " 10 " " " 12.00. For sev. persons to work by.

ELMER E. McINTYRE,

PITTSBURG, PA., U. S. A.

A HEARTY WELCOME!



Paillard Non-Magnetic Watches are Dynamo Proof.

"SEEING IS BELIEVING."—These words mean much, but to see the new PAILLARD NON-MAGNETIC WATCHES will impress the truth more forcibly. The choicest selections of the most renowned makes reveal nothing finer. The watches which received the first prizes and medals at the Government Observatory in Geneva and the Marine Chronometers supplied the Admiralty of Great Britain and France contained PAILLARD NON-MAGNETIC HAIR SPRING AND COMPENSATION BALANCES.

PAILLARD NON-MAGNETIC watches are the finest timekeepers made. They possess all the merits of other makes, with the additional advantage of being absolutely non-magnetic.

Sold by all leading jewelers. Write for pamphlets.

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BATES ELECTRIC FANS

Wound for any Voltage Direct or Alternating.

For Ceiling or Desk A Written Guarantee with each FAN.
D.L. BATES & BRO. DAYTON, O.

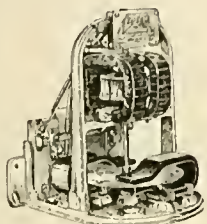
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C.-H. RHEOSTATS

IN USE THAN ALL OTHER MAKES COMBINED.

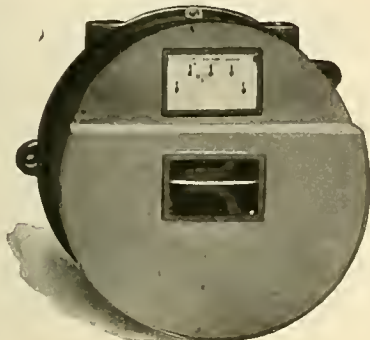
THE CUTLER-HAMMER MFG. CO., 72 W. Jackson Blvd., CHICAGO, ILL.
The Largest Manufacturers of Rheostats In the World.

Wattmeters.



T-H. Type.

Following Spring construction there will be an unusual demand.



Scheeffler Type.

We sell Wattmeters and give prompt shipment.

Central Electric Company,

264-266-268-270 FIFTH AVENUE,

...CHICAGO...



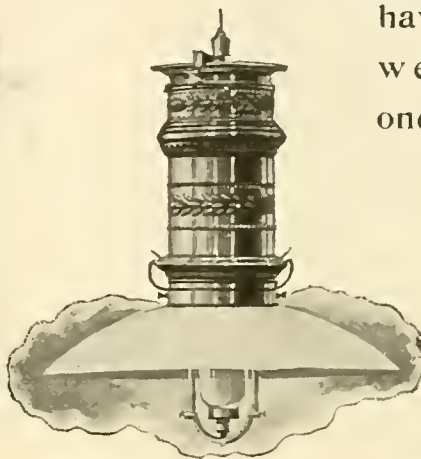
All Enclosed Arc Lamps

have distinctive merits.

This is because they are Enclosed Arc Lamps.

The Morris Enclosed Arc Lamps

have characteristic as well as distinctive ones.



You can learn of each by addressing

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Direct Connected or Belted for Electric Railways, Central Stations, Isolated Lighting or Power Plants.

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We make a specialty of apparatus for the transmission of Electrical Power through factory or other buildings.

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THE WOOD ELECTRIC MOTO-VEHICLES.

SEND FOR "SPECIALLY FINE" CATALOGUE.

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That the vehicle shall be capable of climbing a six per cent. grade with given load when batteries are reasonably well charged.

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AVERAGE COST TO RUN PER MILE, 3.4 CENT.

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Flickering of lights usually occurs when the station is being crowded. It is self-evident that this flickering is caused by the slipping of belts, and as a belt full of Cling-Surface runs steadily and positively beyond all possibility of slipping, the importance of this fact can be readily seen.

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 Victor Electric Co.
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 Western Electric Co.
 Western Elec. Supply Co.

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 Int. Correspond. Schools.

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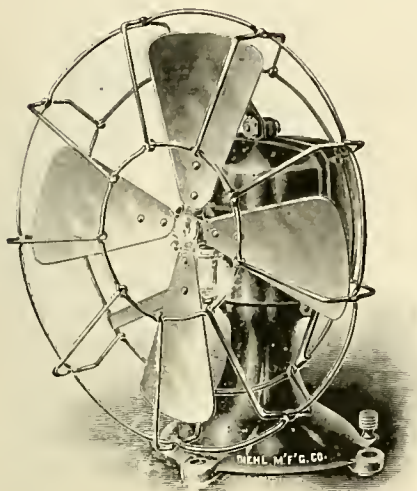
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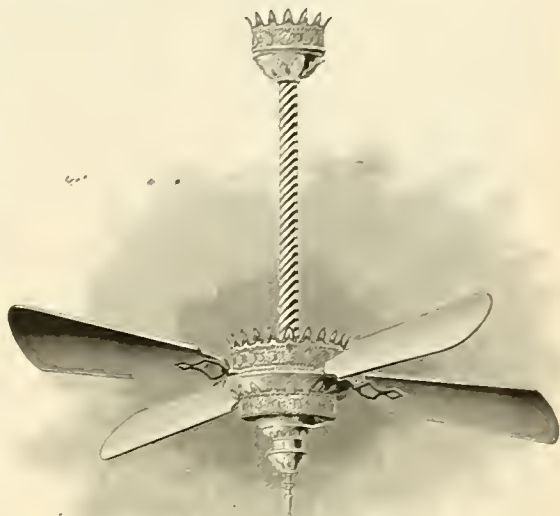
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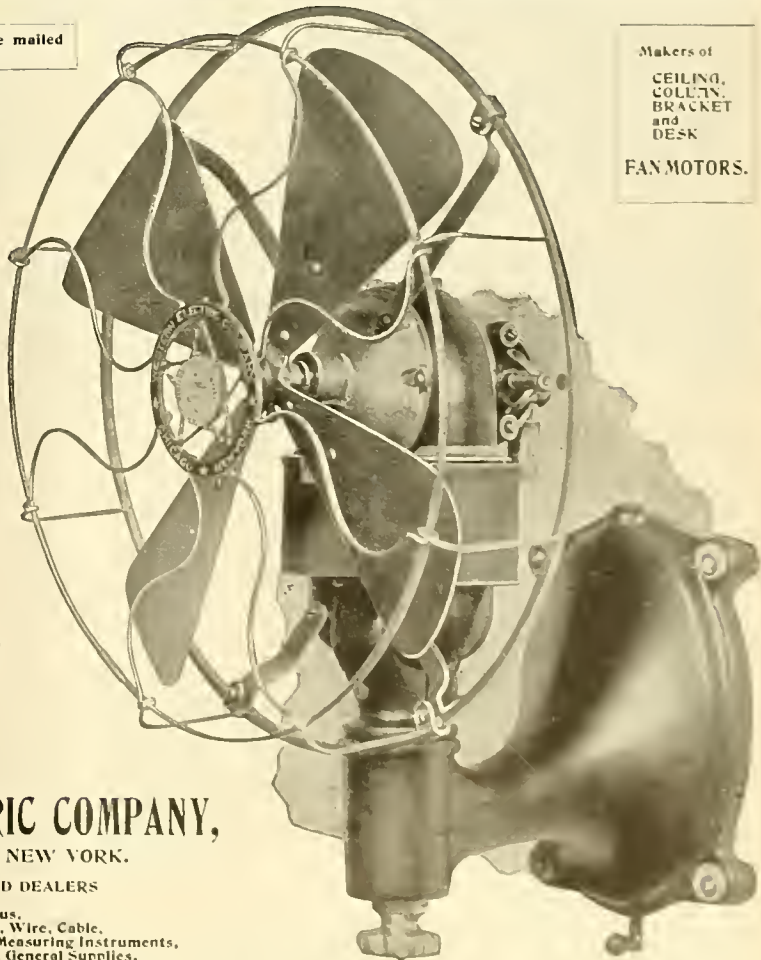
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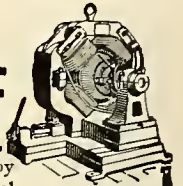
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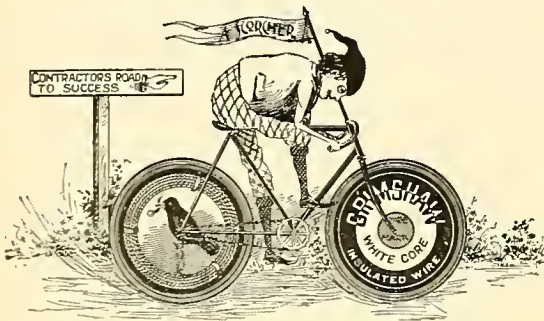
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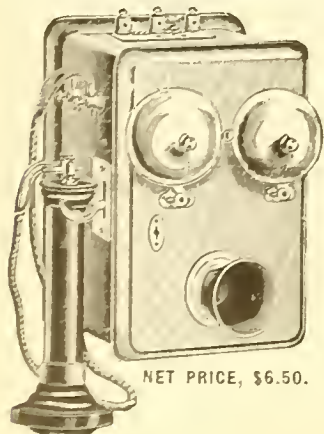
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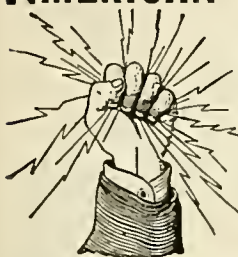
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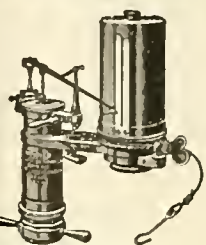
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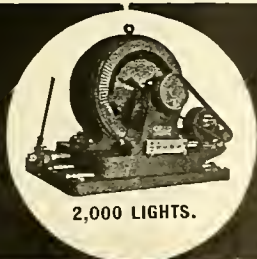
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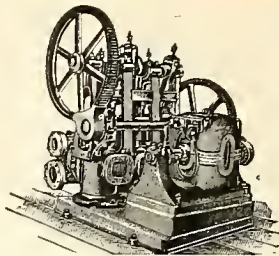
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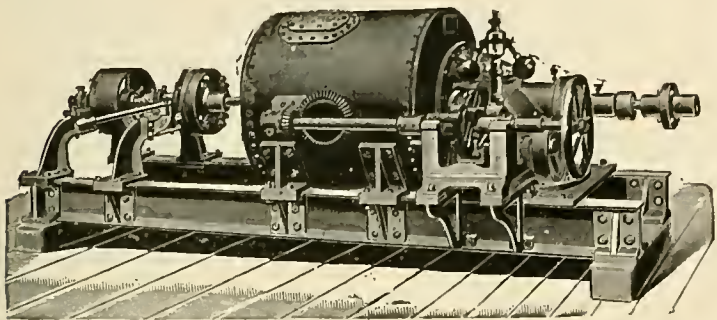
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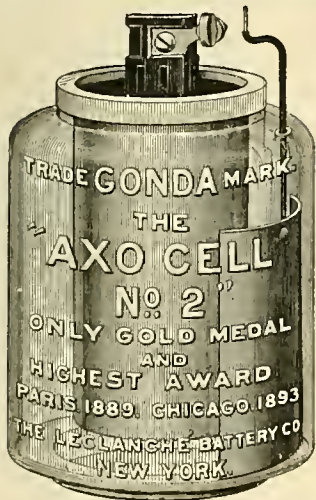
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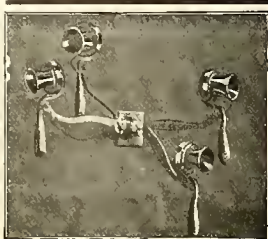
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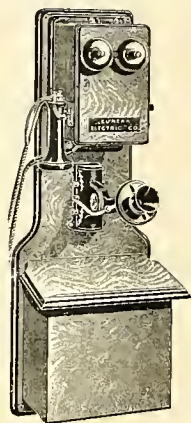
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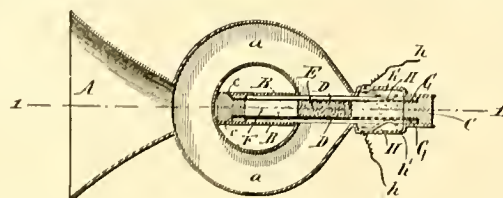
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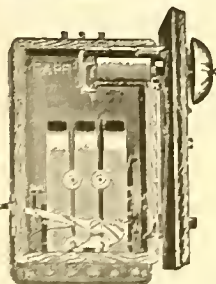
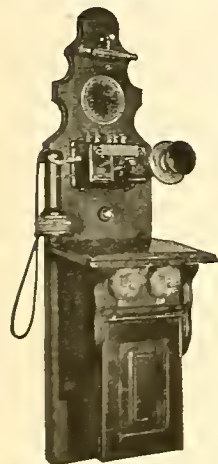
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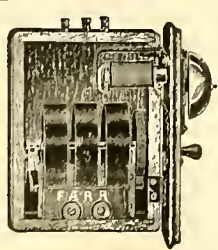
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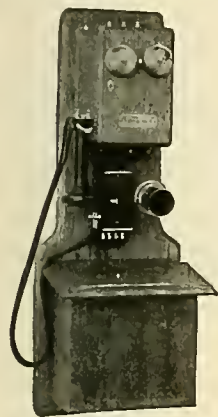
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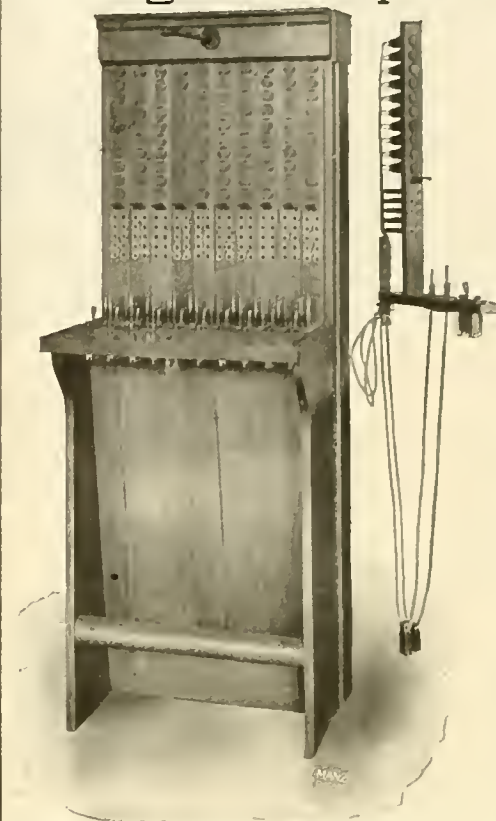
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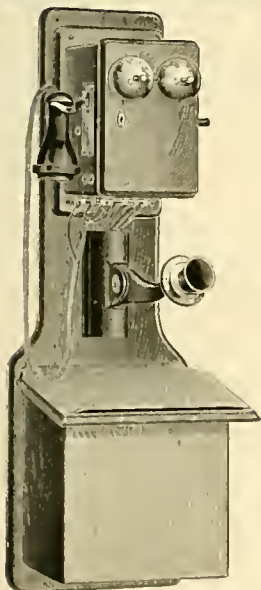
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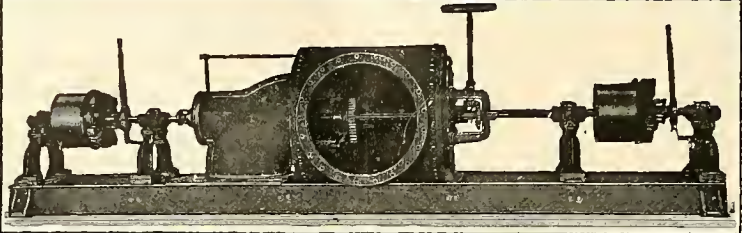
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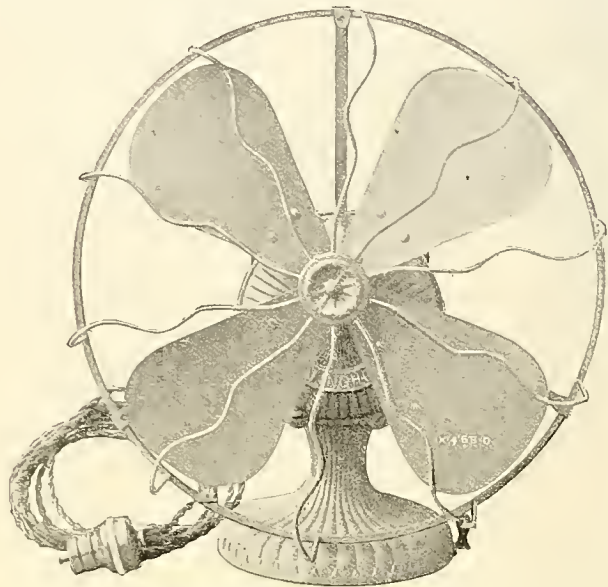
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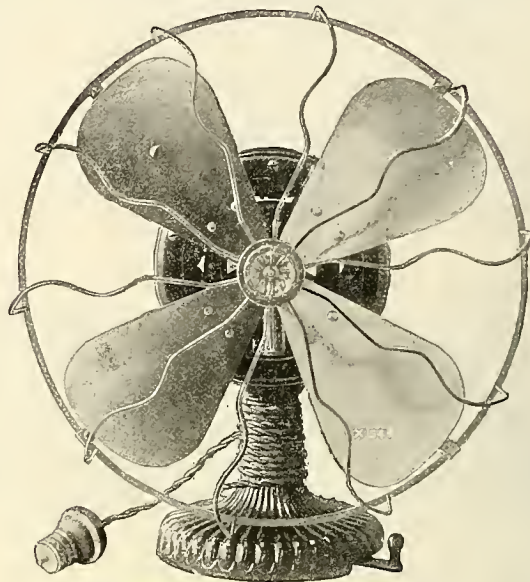
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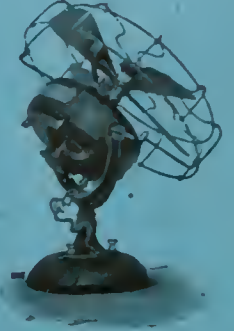
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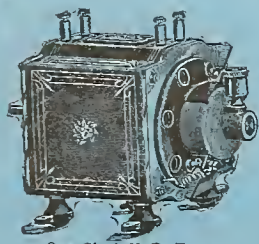
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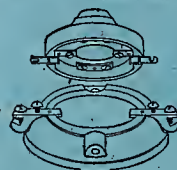
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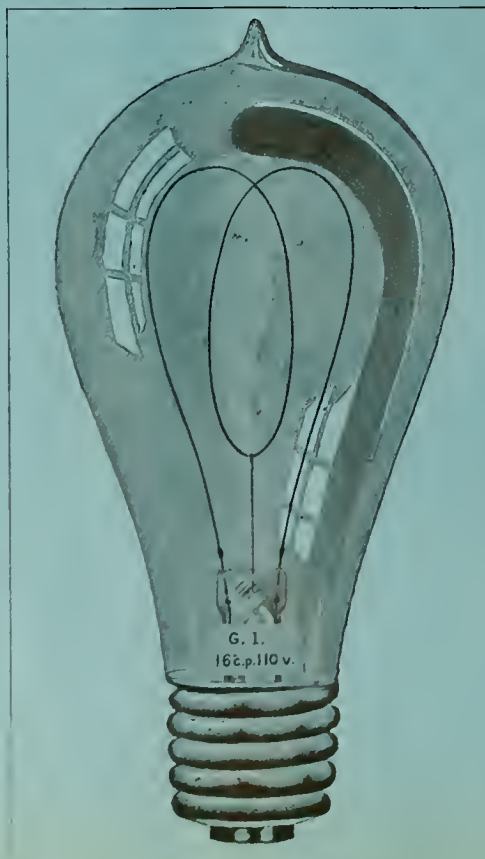
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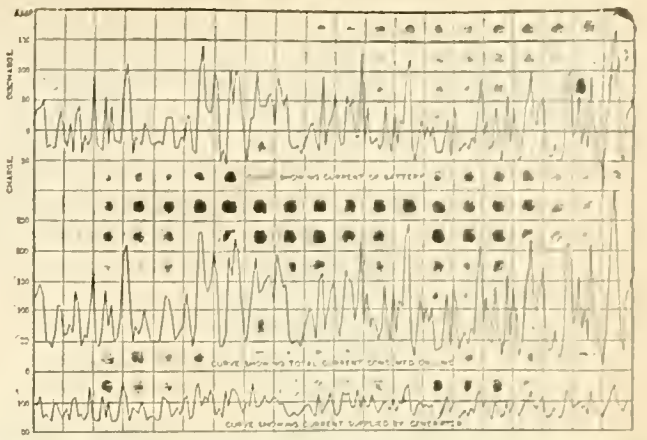
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3-8 in. x 7 in., 8 in., 9 in., 9½ in., 10 in. and 12 in.
7-16 in. x 6 in., 7 in., 8 in., 9 in., 9½ in., 10 in. and 12 in.
1-2 in. x 6 in., 7 in., 7½ in. and 8 in.
5-8 in. x 12 in.

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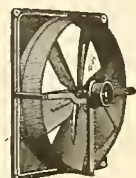
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Fan.



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Consumption.

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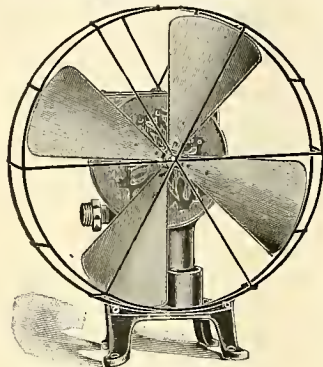
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State Water Pressure.



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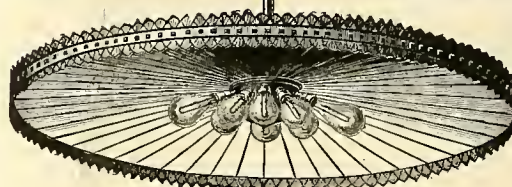
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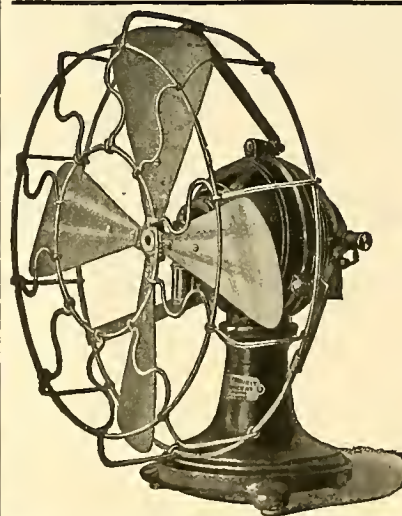
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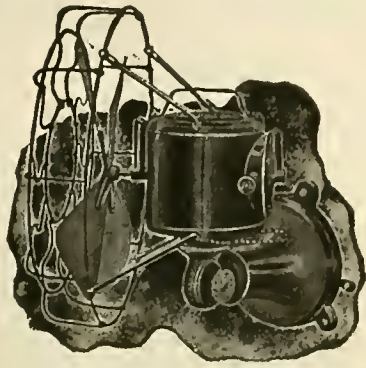
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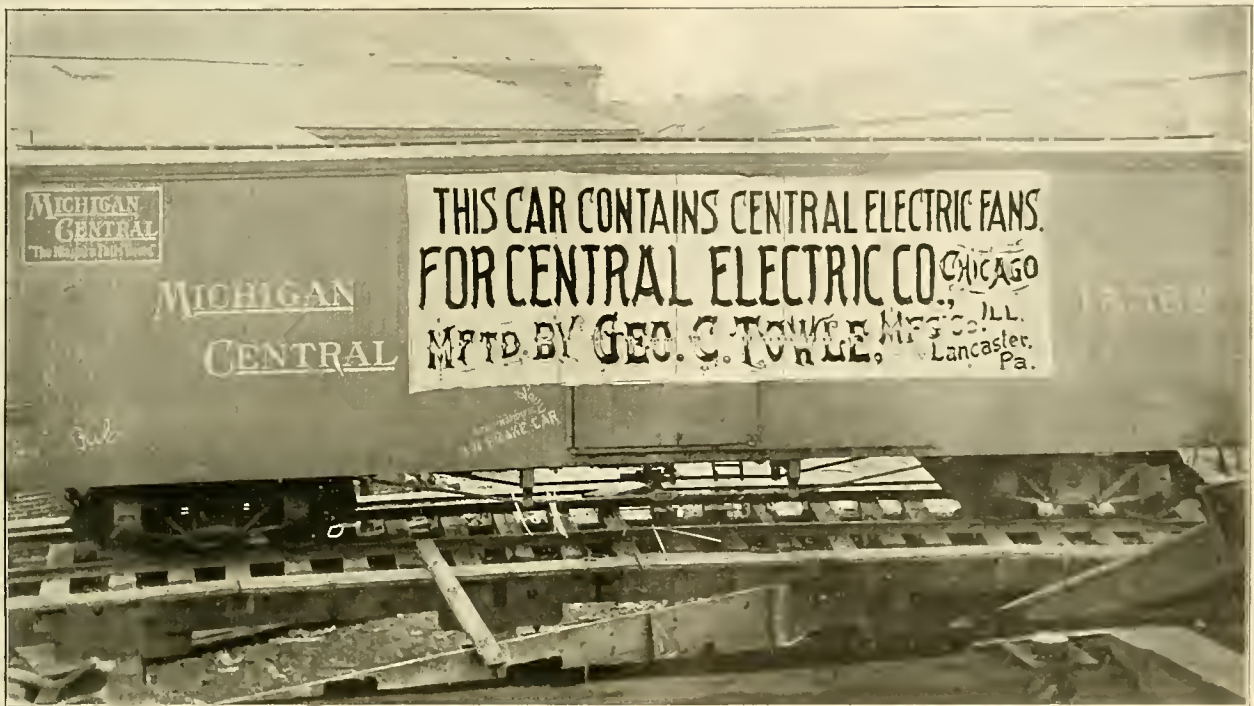
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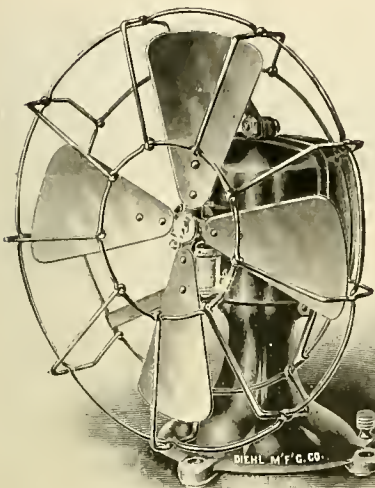
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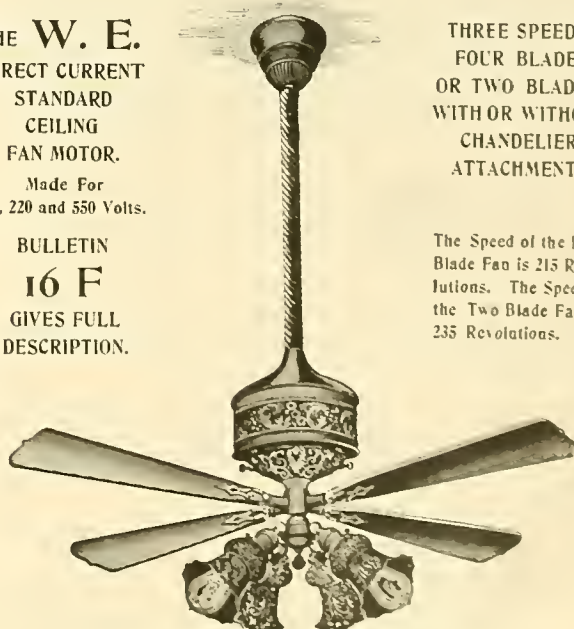
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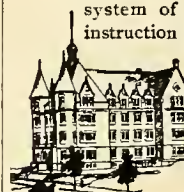
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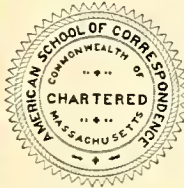


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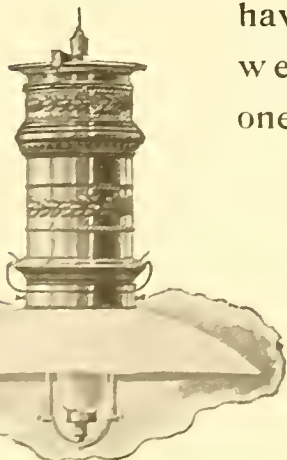
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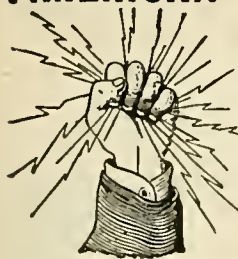
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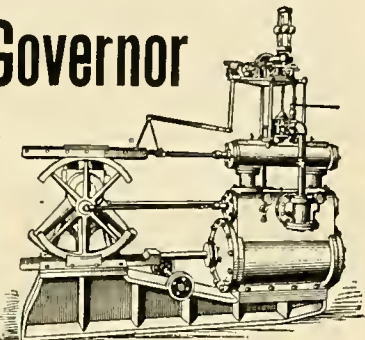
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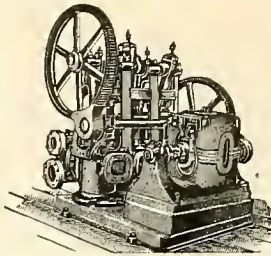
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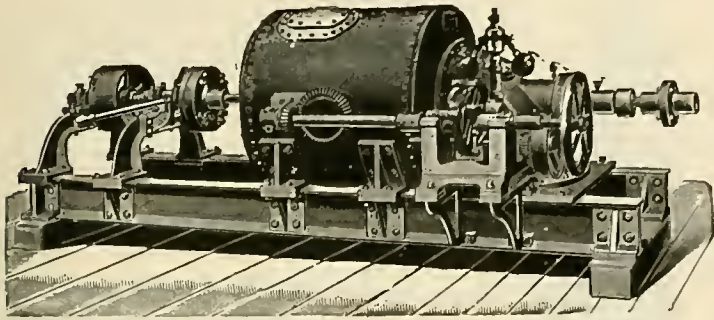
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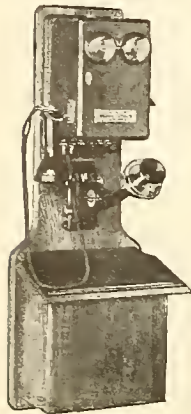
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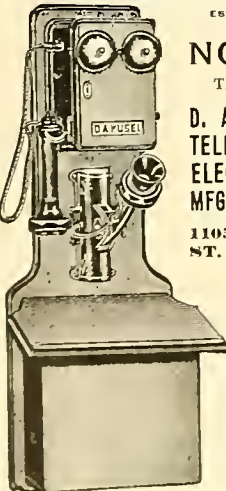
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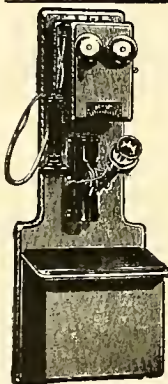
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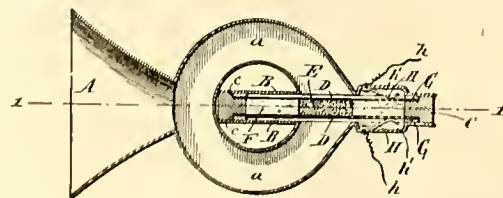
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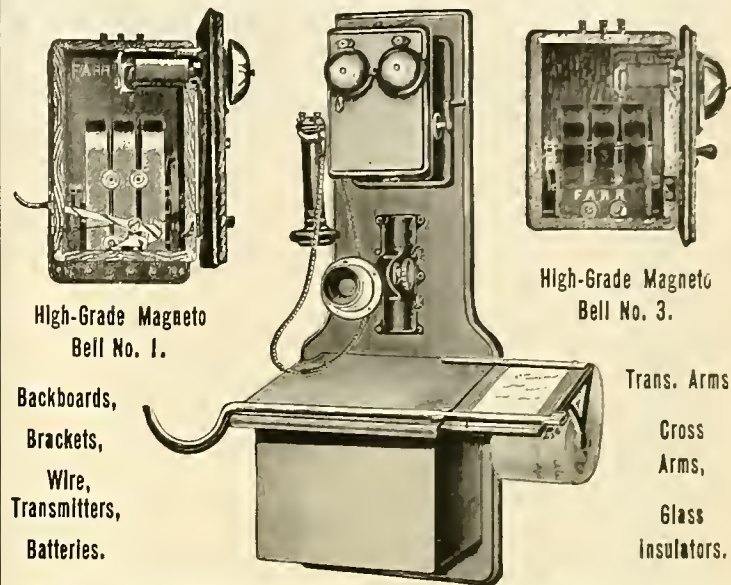
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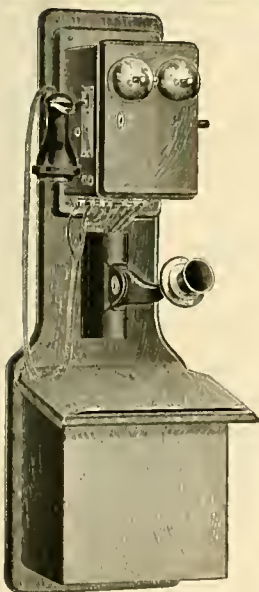


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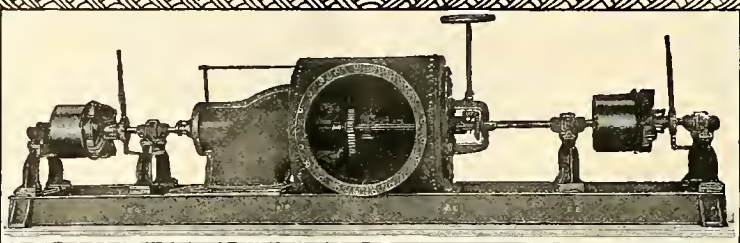
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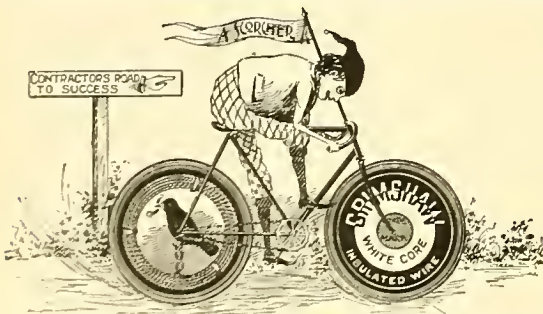
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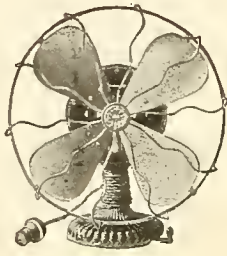
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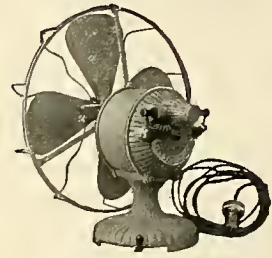
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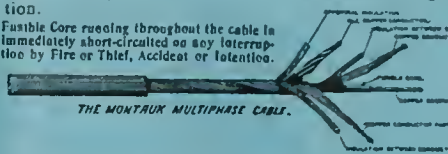
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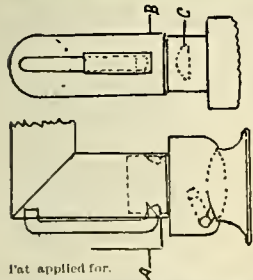
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We have the Largest and Most Complete Electrical

REPAIR SHOPS

In the West. ELECTRICAL REPAIRS AND MACHINE WORK OF EVERY DESCRIPTION. In having your repair work done by a company operating hundreds of dynamos and motors you are sure of good work and get the benefit of our experience.

CHICAGO EDISON COMPANY,

76 MARKET STREET, CHICAGO.

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IF NOT

WRITE FOR CATALOGUE No. 2008.

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Paillard Non-Magnetic Watches are Dynamo Proof.

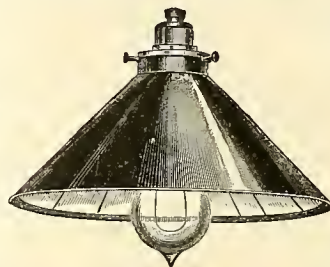
"SEEING IS BELIEVING."—These words mean much, but to see the new PAILLARD NON-MAGNETIC WATCHES will impress the truth more forcibly. The choicest selections of the most renowned makes reveal nothing finer. The watches which received the first prizes and medals at the Government Observatory in Geneva and the Marine Chronometers supplied the Admiralty of Great Britain and France contained PAILLARD NON-MAGNETIC HAIR SPRING AND COMPENSATION BALANCES.

PAILLARD NON-MAGNETIC watches are the finest timekeepers made. They possess all the merits of other makes, with the additional advantage of being absolutely non-magnetic.

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Mirror Reflectors.

A deep cone, for use with any system of incandescent electric light, where it is desired to concentrate a very powerful light on a small space. Lined with silver-plated mirror-plate glass. Increases the light from twelve to fifteen times. Most valuable in show windows and over machines, work-benches, type cases, etc., etc.

Thousands of this style used in show windows. Get our Catalogue and Prices.

American Reflector & Lighting Co.,
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KNAPP FAN MOTOR OUTFITS WITH GORDON PRIMARY CELLS

The hot spell of summer is approaching and to those who wish to seek comfort at home or in the office, professional or mercantile, we desire to call attention to these celebrated outfits.

We guarantee the highest speed at the lowest cost for primary cells.

These fan motor outfits are manufactured in two sizes, as follows:

Type C, 8-inch Fan, with 3 No. 1A Gordon Cells.

Type D, 10-inch Fan, with 4 No. 1A Gordon Cells.

These outfits will give a life of over 150 hours without recharging, at a speed of at least 750 revolutions per minute.

For full particulars, price list, etc., address

GORDON BATTERY COMPANY,

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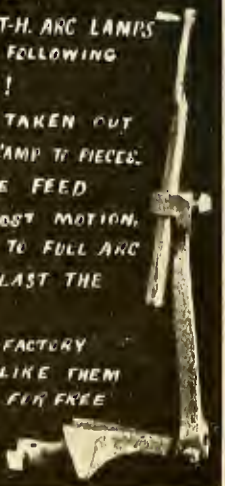
"THE REAL ARTICLE"

THE KNUTSON CARBON ROD GRAVITY CLUTCH FOR T-H. ARC LAMPS
USERS OF CLUTCHES SHOULD CONSIDER THE FOLLOWING
POINTS OF SUPERIORITY!

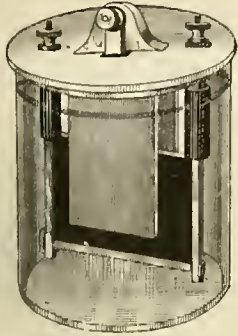
HAS ONLY ONE PIVOTAL HINGE. CAN BE TAKEN OUT OR PUT IN PLACE WITHOUT TEARING THE LAMP TO PIECES.
HAS A Surer GRIP AND A MORE SENSITIVE FEED THAN ANY OTHER CLUTCH. HAS NO LOST MOTION.
WILL NOT PIT A ROD. WILL PICK UP TO FULL ARC INSTANTLY AFTER FEEDING. WILL LAST THE LIFE OF THE LAMP.

GUARANTEED ABSOLUTELY SATISFACTORY
SEND US A TRIAL ORDER. IF YOU DON'T LIKE THEM YOU DON'T HAVE TO PAY FOR THEM. SEND FOR FREE SAMPLE AND FULL PARTICULARS.

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Edison Lelande Batteries



FULLY MEET BATTERY NEEDS OF

Annunciators, Telephones,
Battery Fan Motors,
Gas Engines, Railway Crossing
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Cautery Outfits,

FROM FACT OF HAVING

High Current Delivery at Constant Voltage, Low Internal Resistance, Requiring No Attention Until Charge is Exhausted, and With No Local Action When Circuit is Open.

Edison Lelande Batteries in ample stock and at close prices are supplied by the

CENTRAL ELECTRIC COMPANY,

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CHICAGO.



THE HART H. & H. PUSH SWITCH



IS WITHOUT A PEER.

IT IS EASY TO PUSH.

THE ACTION IS POSITIVE.

THERE IS NO PAINFUL JAR TO THE FINGER WHEN OPERATING.

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Also in gangs of any number up to eight.

We make a special line of Iron Wall Boxes and Frames for the installation of these goods.

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By reason of very much increased factory facilities we are able to announce many extensions of our lines of Manufacture. Among these is a line of direct-current apparatus for printing press and elevator work. DIRECT COUPLED. Write for full information, giving specifications of your requirements.



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Flickering of lights usually occurs when the station is being crowded. It is self-evident that this flickering is caused by the slipping of belts, and as a belt full of Cling-Surface runs steadily and positively beyond all possibility of slipping, the importance of this fact can be readily seen.

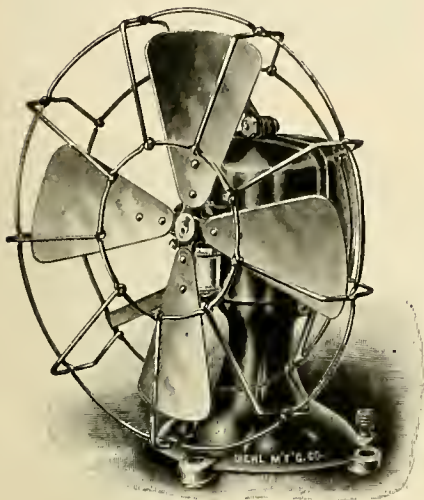
CLING-SURFACE MFG. CO., 177-182 VIRGINIA ST., BUFFALO, N. Y.

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FOR ALL CIRCUITS, EXCEPT ALTERNATING.



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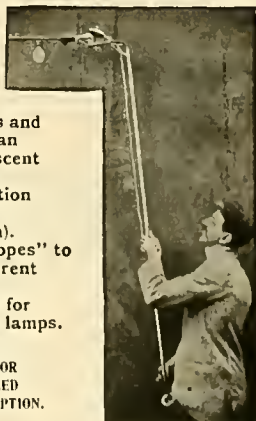


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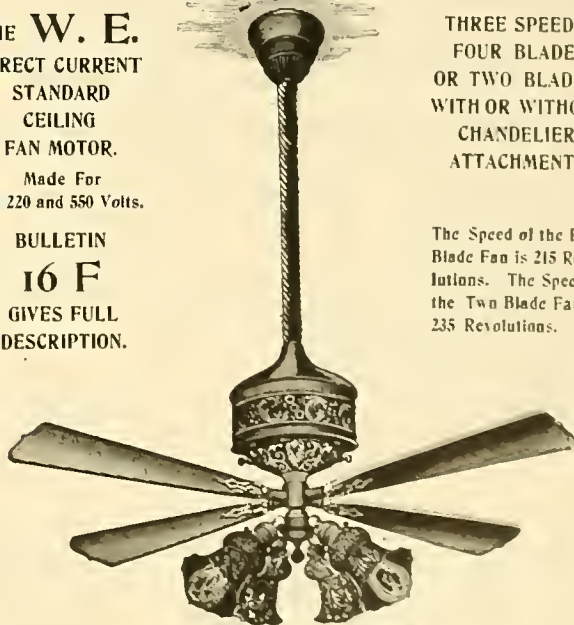
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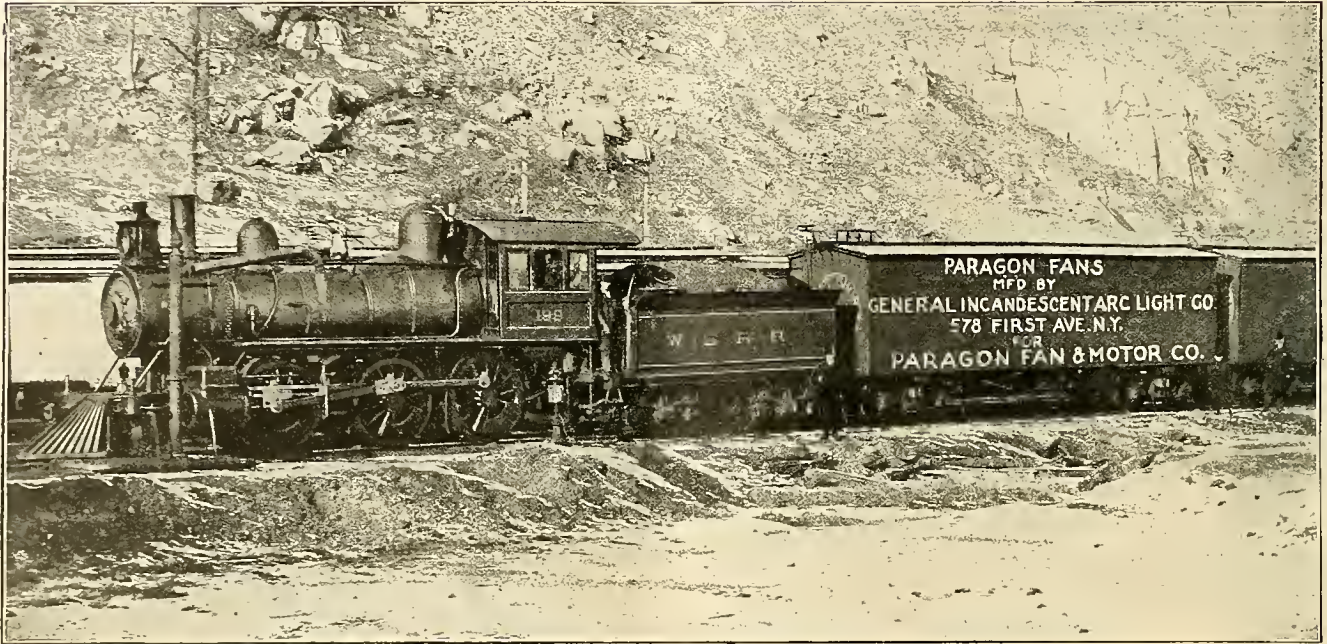
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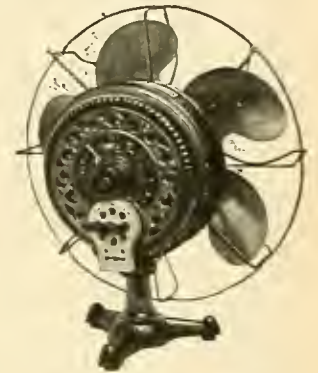
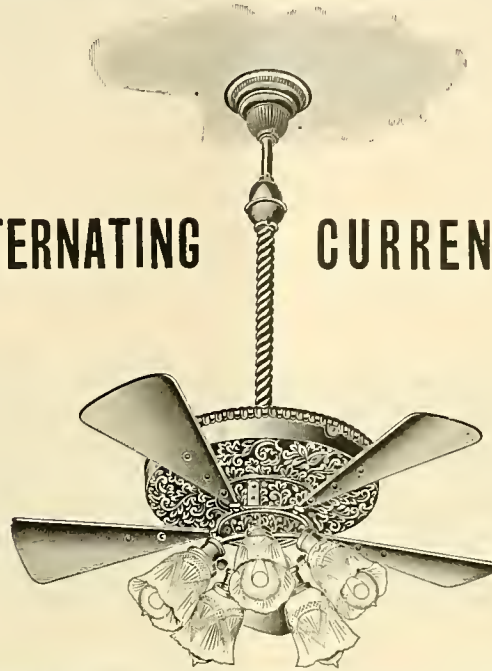
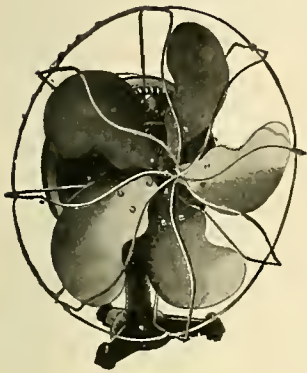
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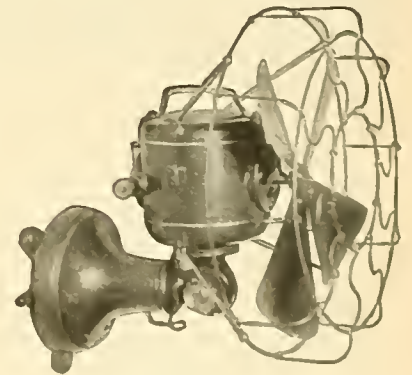
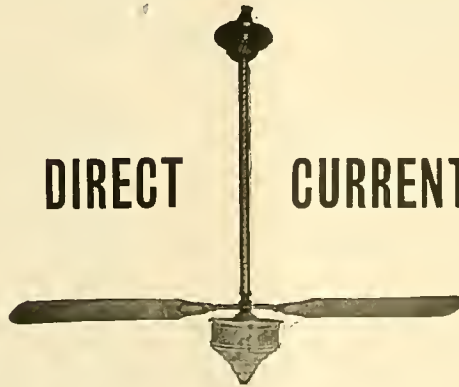
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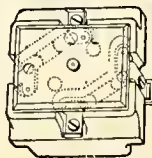
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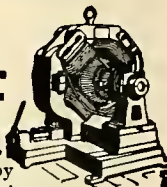
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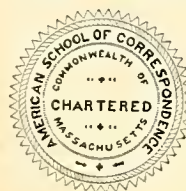
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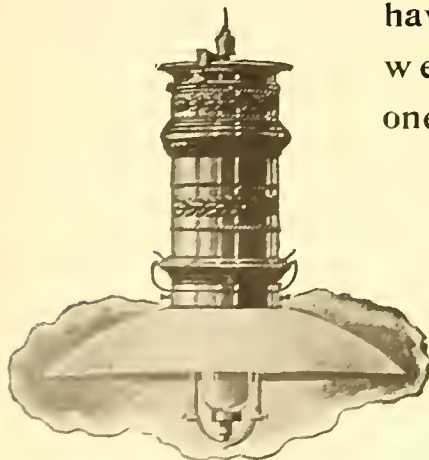
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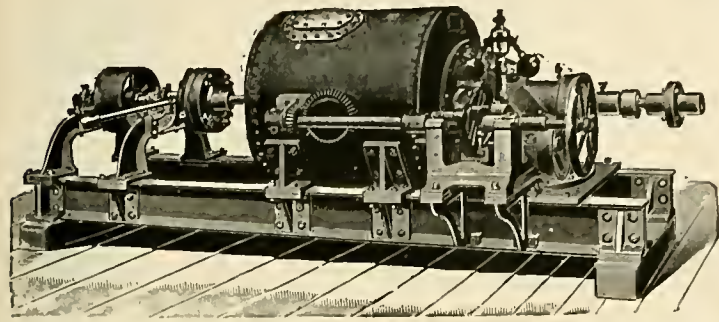
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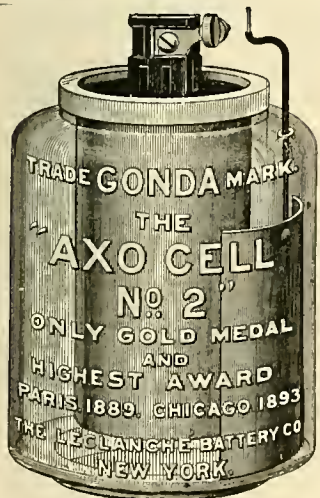
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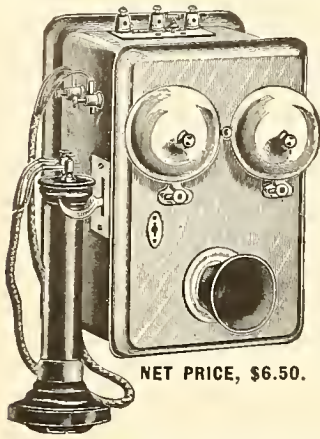
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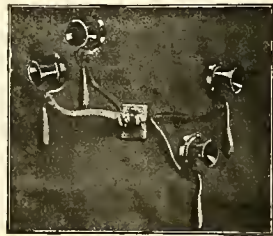
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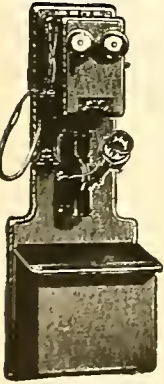
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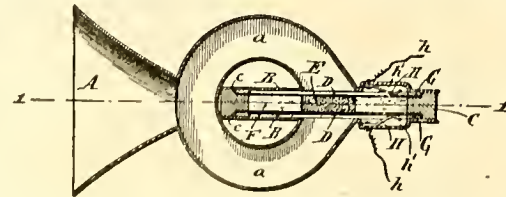
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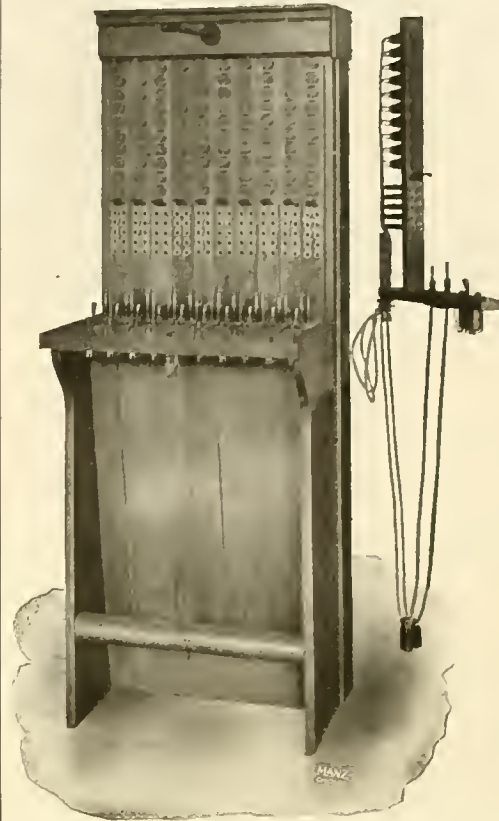
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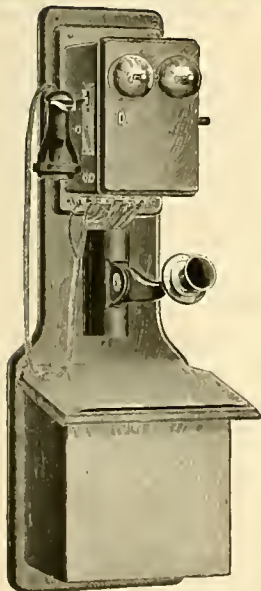
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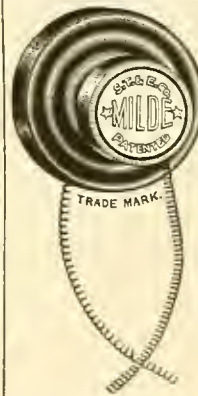
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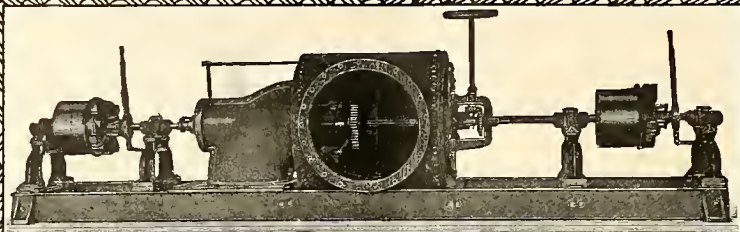
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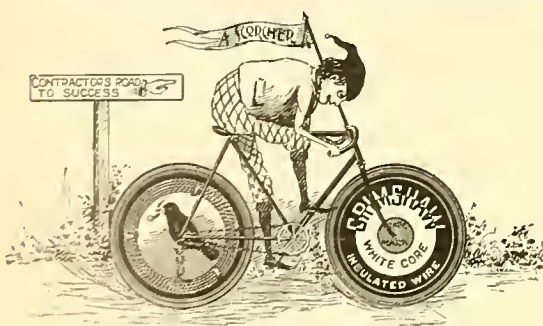
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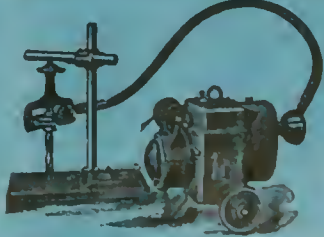
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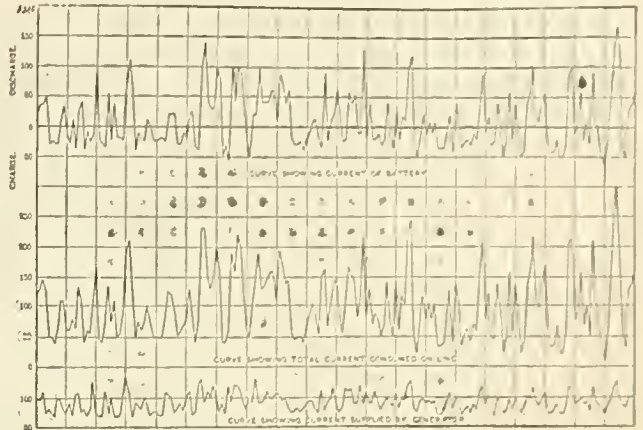
Maximum load on the line.....300 Amperes.
 " " " generator...125 "
 The Battery supplies the excess...175 "
 Variation of load on the line.....290 "
 " " " generator.. 50 "

The Electric Storage Battery Co.,
 DREXEL BUILDING, PHILADELPHIA, PA.

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Cures Electrical Burns Quickly.

No ELECTRICIAN can possibly afford to be without a bottle of **Vitogen** for a single day. You don't know when the burn is coming, but you do know **Vitogen** will prevent serious complications from developing and will also effect a rapid cure. Write for free book, "Vitogen in Practice" (52 pages).

Sold by druggists or mailed on receipt of price—2 oz., 50c.; 4 oz., \$1.00. Canadian price—2 oz., 60c.; 4 oz., \$1.20.

Manufacturing Chemists, **THE G. F. HARVEY CO.**, Saratoga Springs, N. Y., U. S. A.
 Canadian Branch, Mille Roches, Ont., KEZAR & BENNETT, Agents.

How about your T.-H. lamps?

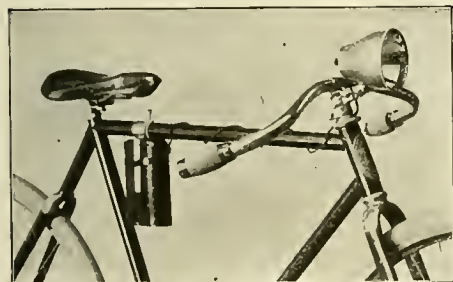
Don't Study Over this Matter Any Longer.

You will be perfectly safe to speculate on this deal; it is a **sure winner**. Besides being the cheapest clutch on the market it is the simplest and best. Overcomes troubles of the trimmer. Will save you hundreds of dollars in lamp repairs. A trial order will settle this matter. You will be pleased, as others are. We don't ask you to send for 100 or 1,000 just to get your money; get a few to start with, we know we will get to sell you more.

A. W. Knutson & Co.,
 Galesburg, Ill.

BUY THE VESTA PORTABLE STORAGE BATTERY.

Light Your Bicycle or Carriage with Electricity.



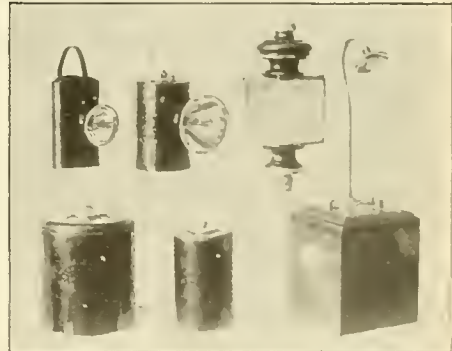
Bicycle, 12 hours' light costs 5c.
 Buggy, 36 hours' light costs 15c.

TO ELECTRICAL MEN EVERYWHERE.

We call your attention to the fact that the Vesta Portable Storage Battery is **Portable** and will stand the jar and usage necessary to light a Bicycle or Carriage. Ask and we will give you full information.

Vesta Accumulator Co.,

D. P. PERRY, Prest. 53 Dearborn Street, CHICAGO.



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HARDTMUTH CORED AND SOLID CARBONS

FOR DIRECT CURRENT ARC LAMPS.

WE HAVE IN STOCK THE FOLLOWING SIZES:

CORED CARBONS.

Diameter. Length.

5-16 in. x 6 in., 6½ in., 7 in., 7½ in. and 8 in.

3-8 in. x 7 in., 8 in., 9 in., 9½ in., 10 in. and 12 in.

7-16 in. x 6 in., 7 in., 8 in., 9 in., 9½ in., 10 in. and 12 in.

1-2 in. x 6 in., 7 in., 7½ in. and 8 in.

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SOLID CARBONS.

Diameter. Length.

7-16 in. x 7 in. and 10 in.

1-2 in. x 6 in., 7½ in. and 12 in.

Having received a large consignment of these Carbons just before the new tariff went into effect, we are prepared to make very low prices. Send for price list.

CHICAGO EDISON COMPANY,

EDISON BUILDING, 139 ADAMS STREET, CHICAGO.

TRIUMPH EXHAUST FAN.

Guaranteed to move

Only Successful

More Air,
Dust, Heat,
Steam, Etc.,
With Less
Power
Than any other
Fan.



Water Blow
Fan.

Flies have no
use for them.

Attractive,
Efficient,
Durable,
Most Economical
Water
Consumption.

Send for Catalog X.

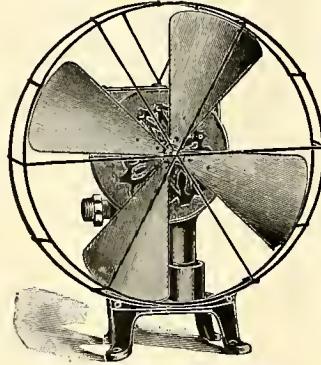
SPECIALTY MFG. Co.,

361 to 367 S. Meridian St.,

INDIANAPOLIS, IND.

JUNIOR WATER BLOW FAN.

State Water Pressure.



Pat. Applied for. Price \$7.50.

KNAPP FAN MOTOR OUTFITS WITH GORDON PRIMARY CELLS

The hot spell of summer is approaching and to those who wish to seek comfort at home or in the office, professional or mercantile, we desire to call attention to these celebrated outfits.

We guarantee the highest speed at the lowest cost for primary cells.

These fan motor outfits are manufactured in two sizes, as follows:

Type C, 8-inch Fan, with 3 No. 1A Gordon Cells.

Type E, 10-inch Fan, with 4 No. 1A Gordon Cells.

These outfits will give a life of over 150 hours without recharging, at a speed of at least 750 revolutions per minute.

For full particulars, price list, etc., address

GORDON BATTERY COMPANY,

594 Broadway, New York.

Western Representative, GEORGE W. PATTERSON, 1539 Marquette Bldg., Chicago, Ill.



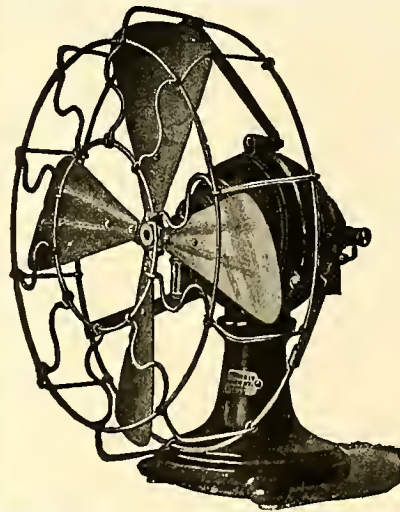
NEW DESIGNS

BATES ELECTRIC FANS

Wound for any Voltage Direct or Alternating.

For Ceiling or Desk A Written Guarantee with each FAN.

D.L. BATES & BRO. DAYTON, O.



Lundell Fans

ALWAYS the BEST.

A Full Stock.

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239 Madison St., CHICAGO.

ESTABLISHED 1878.

J. H. BUNNELL & CO.,

76 CORTLANDT STREET, CORNER WASHINGTON STREET,
...NEW YORK...

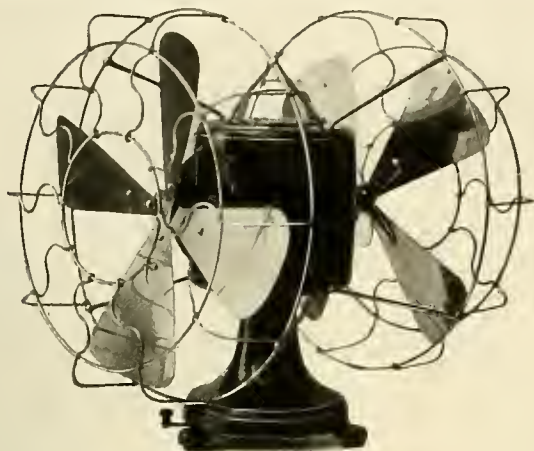
We Are Here to Fill Orders for Everything Electrical at Right Prices.

Prompt attention given to all inquiries and orders. We shall continue to deserve the honored distinction of being the makers of the **BEST TELEGRAPH INSTRUMENTS ON EARTH.** They are the acknowledged Standard of the World. We have just issued a new Telephone Catalogue and Manual of Telegraphy. Send for a copy, and mention this paper.

J. H. BUNNELL & COMPANY,

76 Cortlandt Street, Cor. Washington, NEW YORK.

Central Duplex Fan Motors



TWO IN ONE,

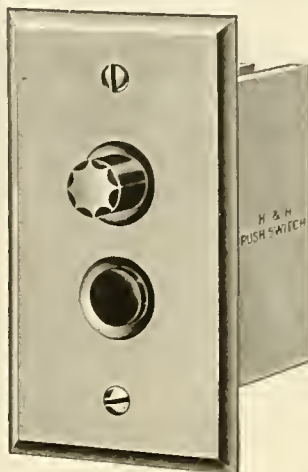
And at but half the price additional over that for 12-inch Central Desk Fan Motor.

Central Electric Company,

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CHICAGO.



THE HART H. & H. PUSH SWITCH



IS WITHOUT A PEER.
IT IS EASY TO PUSH.
THE ACTION IS POSITIVE.
THERE IS NO PAINFUL JAR TO THE FINGER WHEN OPERATING.

THE DESIGN, WORKMANSHIP AND MATERIAL ARE THE BEST THAT CAN BE OBTAINED.

MADE IN THE FOLLOWING STYLES, 10-AMPERE CAPACITY ONLY:

- NO. 701 SINGLE POLE.
- NO. 702 DOUBLE POLE.
- NO. 703 THREE-WAY.
- NO. 704 FOUR-WAY.

Also in gangs of any number up to eight.
We make a special line of Iron Wall Boxes and Frames for the installation of these goods.

MANUFACTURED BY

THE HART & HEGEMAN MFG. CO.,

99 HIGH STREET, HARTFORD, CONN.

CHICAGO: MONADNOCK BLOCK.
NEW YORK: MAIL AND EXPRESS BUILDING.

May 20th May 27th

These are the dates of the WESTERN ELECTRICIAN'S two special Convention-Exhibition numbers; the first will be distributed everywhere at the Convention and Electrical Exhibition, and the second will contain a full account of the Convention.

If you have something worth saying about your business, this is the time to tell it to all the electrical people through a large display advertisement in these editions.

Please send us your order for space as soon as possible.

Copy and order for issue May 20th should be sent in immediately.

WESTERN ELECTRICIAN,

510 MARQUETTE BLDG., CHICAGO.

Flickering of lights usually occurs when the station is being crowded. It is self-evident that this flickering is caused by the slipping of belts, and as a belt full of Cling-Surface runs steadily and positively beyond all possibility of slipping, the importance of this fact can be readily seen.

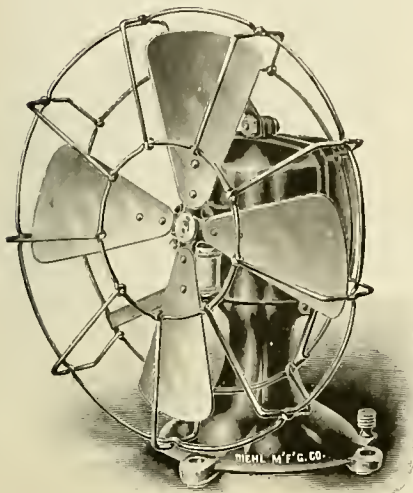
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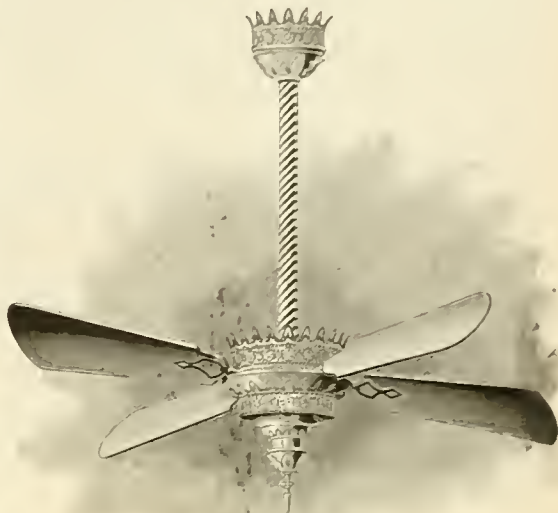
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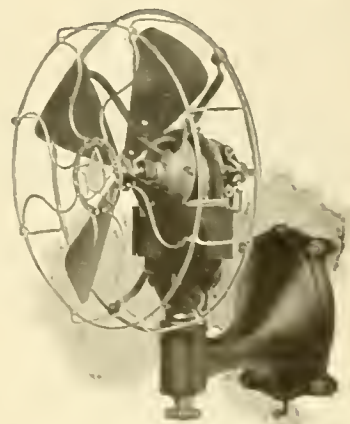
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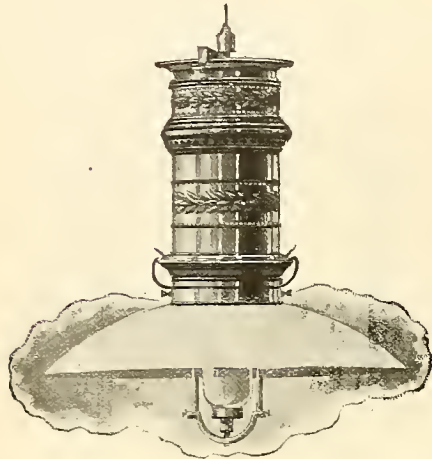
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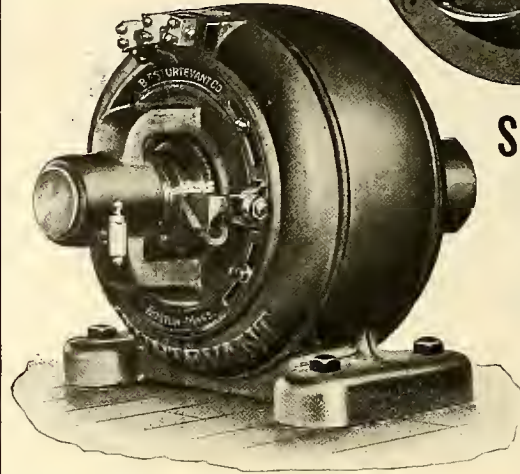
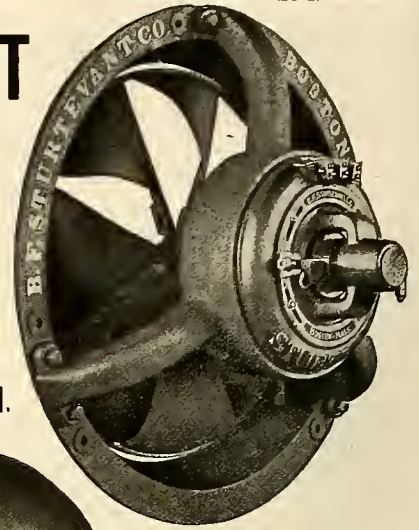
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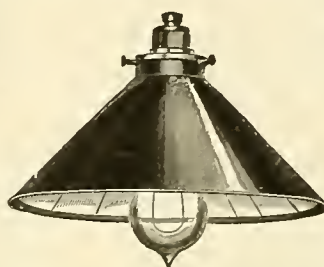
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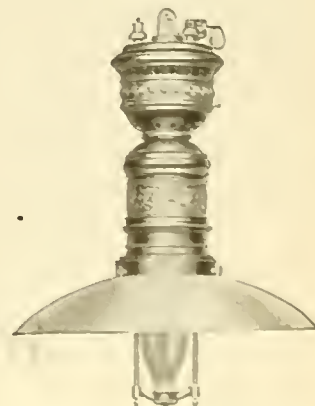
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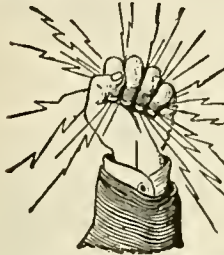
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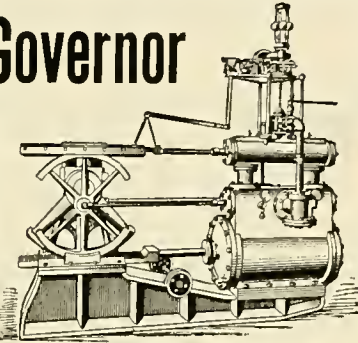
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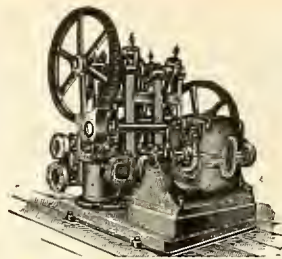
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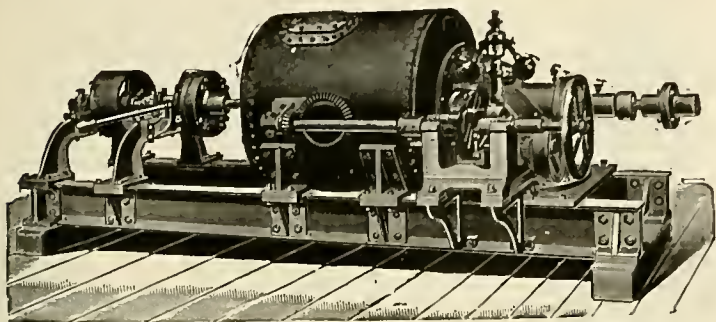
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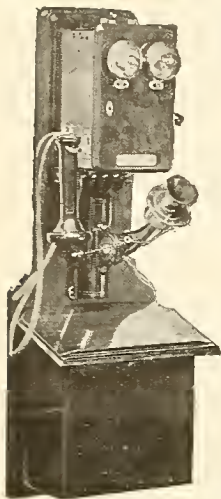
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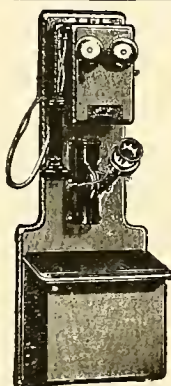
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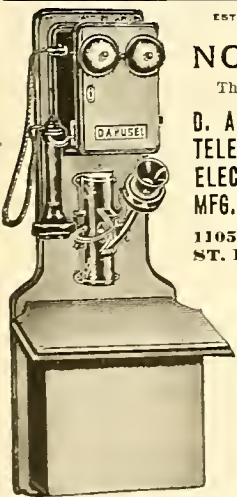
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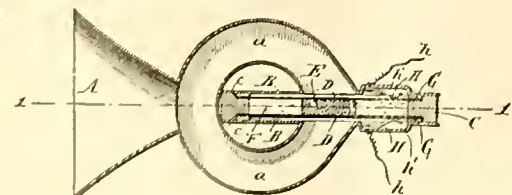
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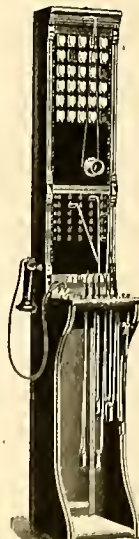
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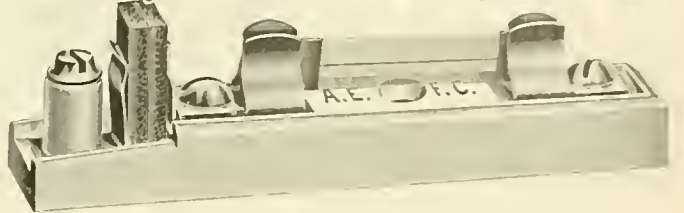
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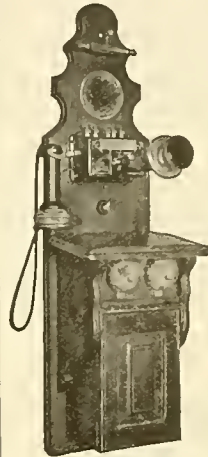
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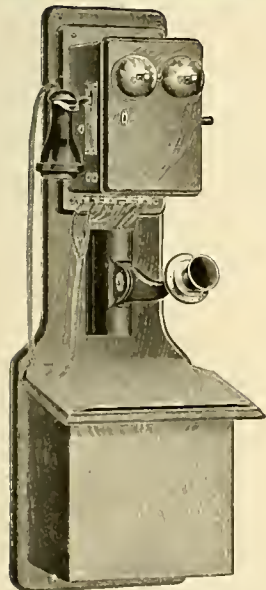


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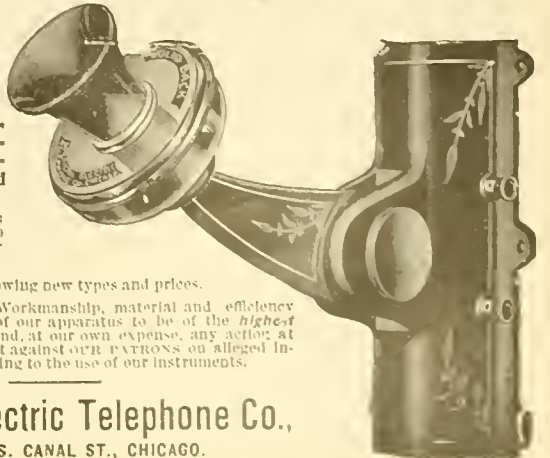
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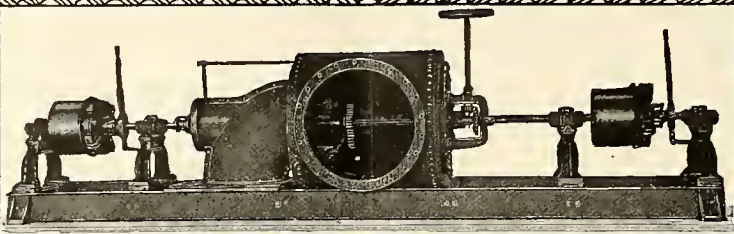
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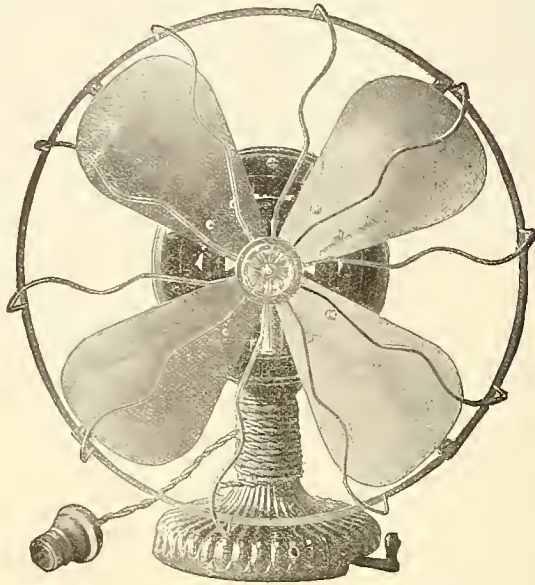
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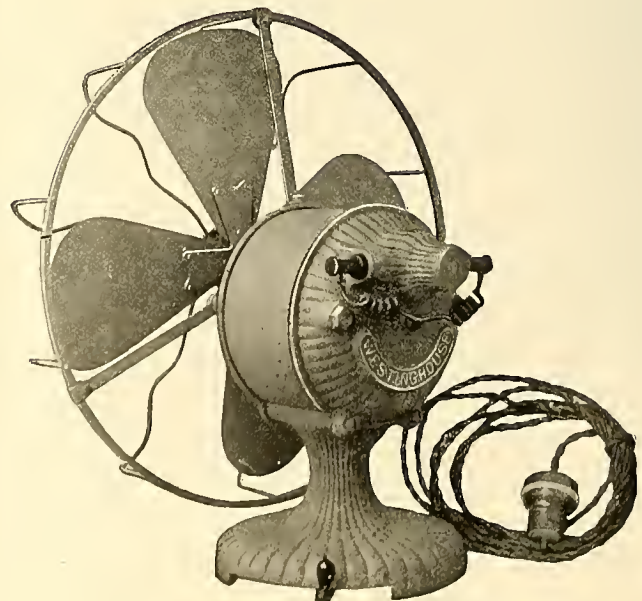
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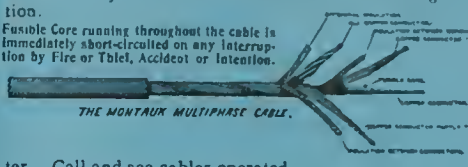
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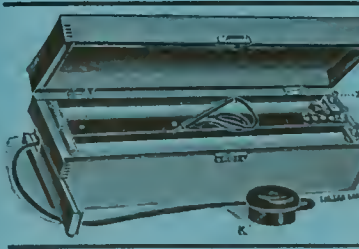
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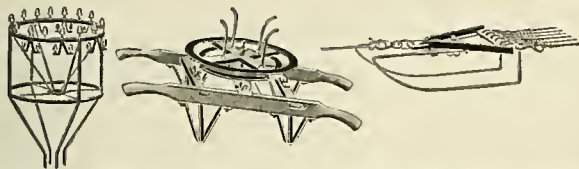
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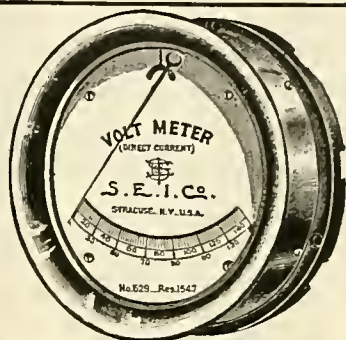
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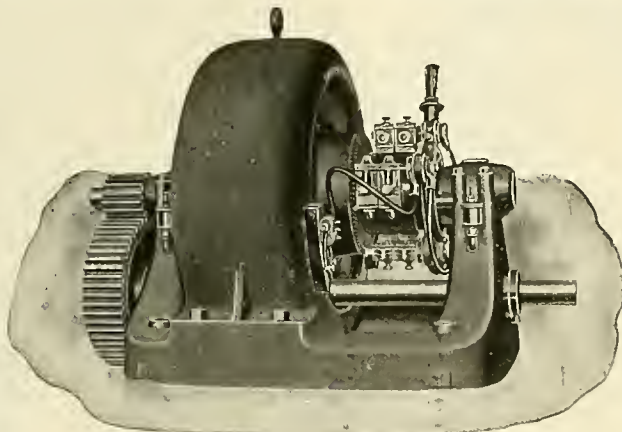
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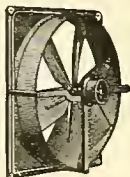
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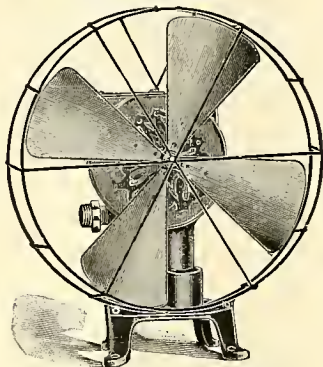
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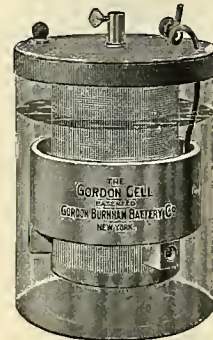
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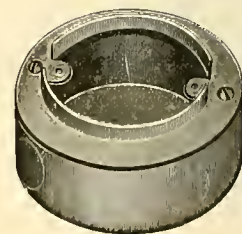


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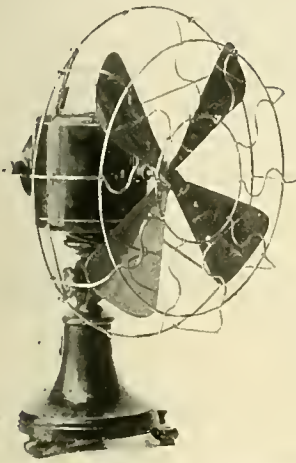
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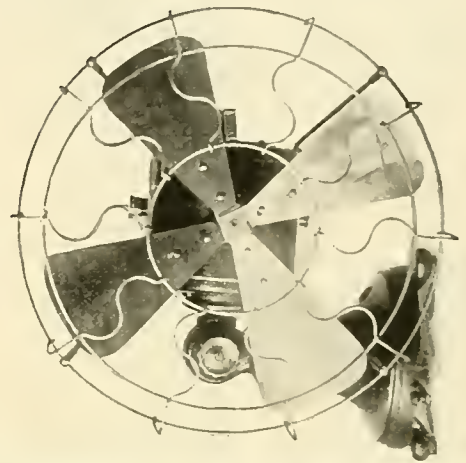
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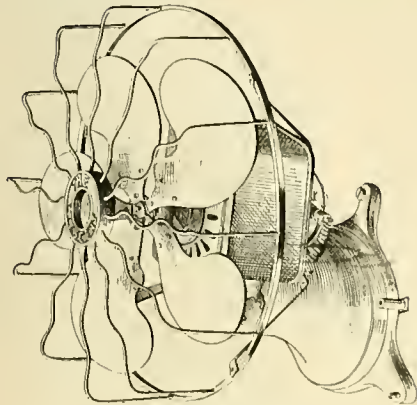
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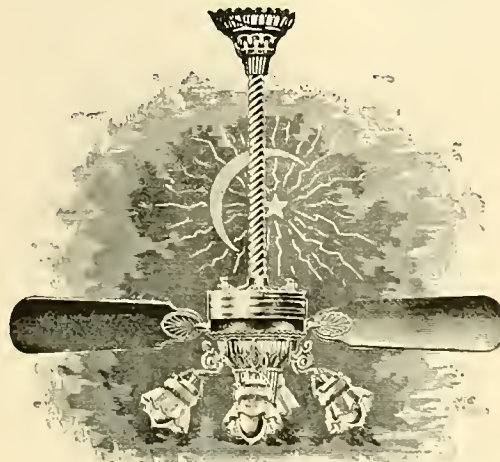
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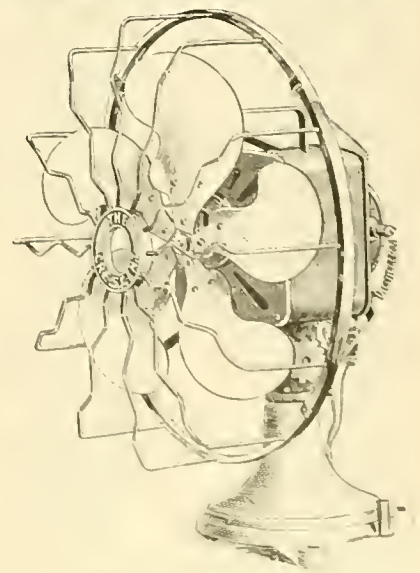
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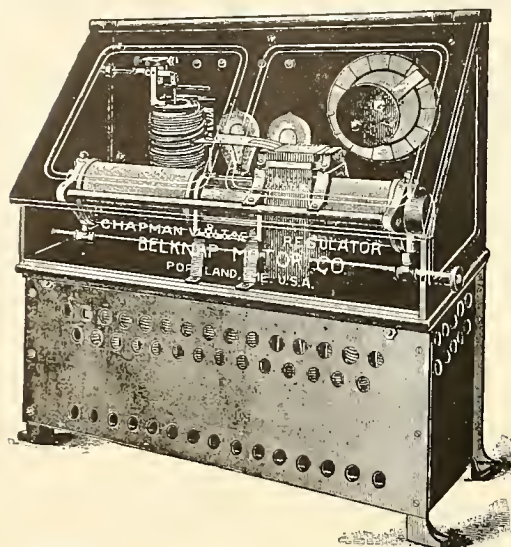
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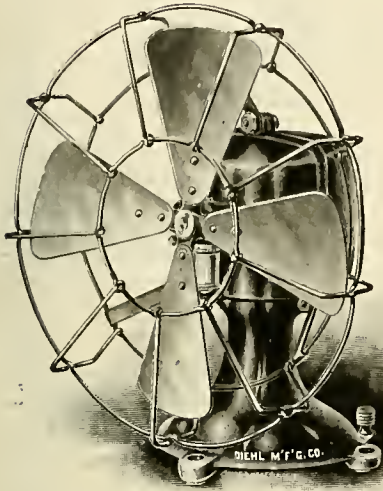


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Manhattan Elec. Sup. Co.
National Carbon Co.
Peru Elec. Mfg. Co.
Roche, Wm.
Victor Electric Co.
Western Electric Co.
- Bearings and Bearing Metal.**
Leschen-Macomber-Whyte Co.
- Bells.**
Bunnell & Co., J. H.
Central Electric Co.
Edwards & Co.
Electric Appliance Co.
Eusbel & Manger.
Illinois Electric Co.
Western Electric Co.
Western Elect. Supply Co.
- Belt Dressing.**
Cling-Surface Mfg. Co.
Leather Preserver Mfg. Corp.
- Belting.**
Leather Preserver Mfg. Corp.
Peoria Rubber Mfg. Co.
Shulls Baling Co.
- Bicycle Lamps.**
Vesta Accumulator Co.
- Books, Electrical.**
American Tech. Book Co.
Electrician Publishing Co.
- Brushes.**
Central Electric Co.
Hobart Elec. Mfg. Co.
Holmes Fibre & Graphite Co.
Kester Electric Mfg. Co.
Western Elect. Supply Co.
- Burglar Alarms.**
Bunnell & Co., J. H.
Central Electric Co.
Edwards & Co.
Electric Appliance Co.
Eusbel & Manger.
Western Elect. Supply Co.
- Cables (See Insulated Wires.)**
Cables, Electric (See Insulated Wires), Copper, Sheet and Bar.
- American Elec. Works.**
Bunnell & Co., J. H.
Central Electric Co.
Chicago Insulated Wire Co.
Eastern Electric Cable Co.
General Electric Co.
Illinois Electric Co.
New York Ins. Wire Co.
Simplex Electrical Co.
Standard Underground C. Co.
Western Elect. Supply Co.
- Carbon, Points & Plates.**
Central Electric Co.
Chicago Edison Co.
Electric Appliance Co.
National Carbon Co.
Peoria Rubber Mfg. Co.
Western Elect. Supply Co.
- Chemists.**
Harrer Co., The G. P.
Tiger Lighters.
- Clutches (Arc Lamps).**
Knute & Co., A. W.
Colls.
Spindler, C. P.
Varley Duplex Magnet Co.
- Compound.**
Dearborn Drug & Chem. Wks.
Illinois Electric Co.
- Mass. Onemol Co.**
Malleson & Co., K.
Standard Elec. Co.
Western Electric Co.
Western Elect. Supply Co.
- Conduit and Conduits.**
American Circular Loom Co.
Central Electric Co.
Electric Appliance Co.
Western Elect. Supply Co.
- Construction & Repairs.**
Chicago Edison Co.
Eddy Elec. Mfg. Co.
Hays Construction Co.
Hodge-Walsh Elec. Eng. Co.
Kester Electric Co.
Sturtevant Co., B. F.
Victor Electric Co.
Wagner Elec. Mfg. Co.
Western Electric Co.
Western Elect. Supply Co.
- Contractors and Electric Light Plants.**
Bain, Fores.
Bryan & Humphrey.
Central Electric Co.
Diell Mfg. Co.
Eddy Elec. Mfg. Co.
General Electric Co.
Hays Construction Co.
Kester Electric Co.
Sturtevant Co., B. F.
United Elec. Imp. Co.
Wagner Elec. Mfg. Co.
Warren Elec. Mfg. Co.
Western Electric Co.
Western Elect. Supply Co.
Westinghouse El. & Mfg. Co.
- Copper.**
Bosly & Co., Chas. H.
- Copper Wires.**
American Electrical Works.
Bosly & Co., Chas. H.
Bunnell & Co., J. H.
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Chicago Edison Co.
Chicago Insulated Wire Co.
Electric Appliance Co.
General Electric Co.
Illinois Electric Co.
National India Rubber Co.
Okonite Co., The.
Phillips Insulated Wire Co.
Roebling's Sons Co., J. A.
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Samson Cordage Wks.
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Central Mfg. Co.
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Farr Tel. & Cons. Sup. Co.
Farr Tel. & Cons. The.
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- Cut-Outs and Switches.**
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Bosart Elec. Const. Co.
Bryant Electric Company.
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Chicago Edison Co.
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Emerson El. Mfg. Co.
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Gates & Randolph.
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General Inc. Arc Light Co.
Hart & Hegeman Mfg. Co.
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Palma Co., H. T.
Peru Elec. Mfg. Co.
Wagner Elec. Mfg. Co.
Western Electric Co.
Western Elect. Supply Co.
Westinghouse El. & Mfg. Co.
- Dynamoes.**
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Chicago Rheostat Co.
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Crescent Wheelbarrow Co.
Diell Mfg. Co.
Eagle Electric Works.
Eddy Elec. Mfg. Co.
Gates & Randolph.
General Electric Co.
General Inc. Arc Light Co.
Hobart Elec. Mfg. Co.
Kester Electric Co.
Mathews, W. N.
Wagner, M. M. Elec. Co.
Sturtevant Co., B. F.
Tribune Electric Co.
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Central Electric Co.
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Gates & Randolph.
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H. I. Co.
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Western Electric Co.
Western Elect. Supply Co.
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Western Electrical Inst. Co.
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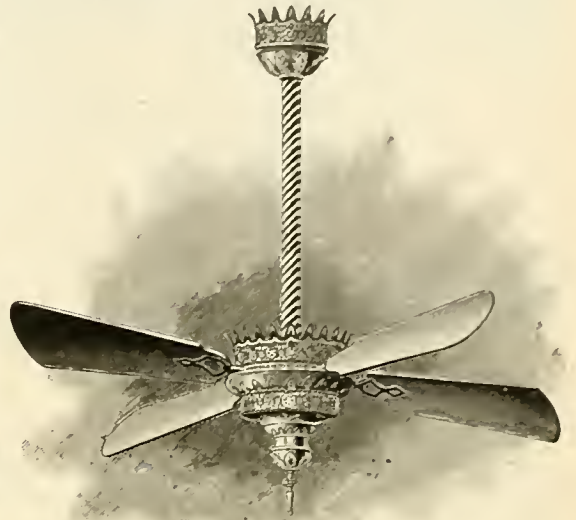
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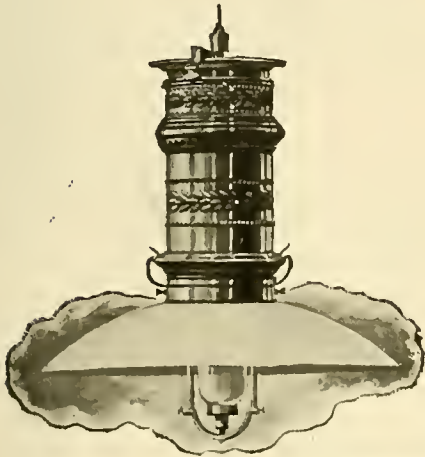
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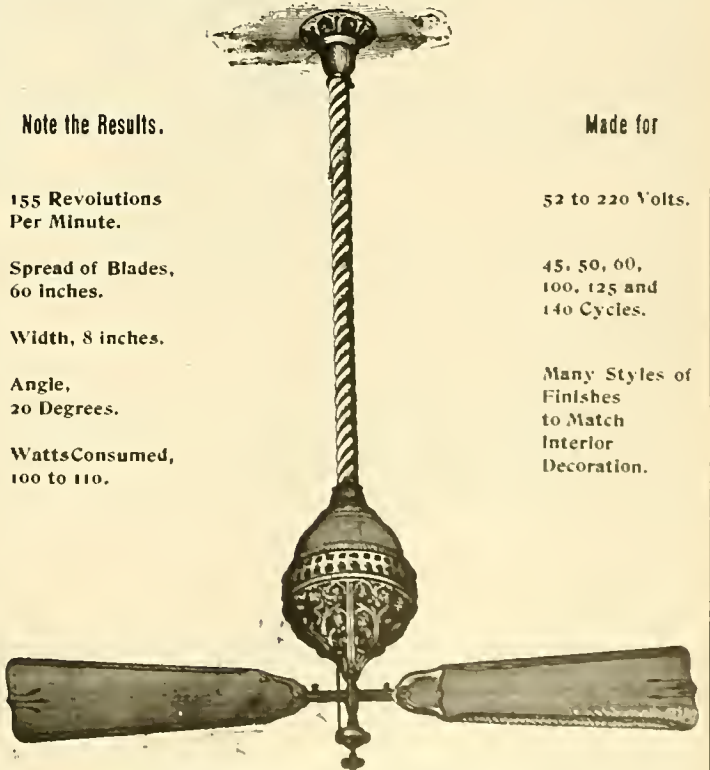
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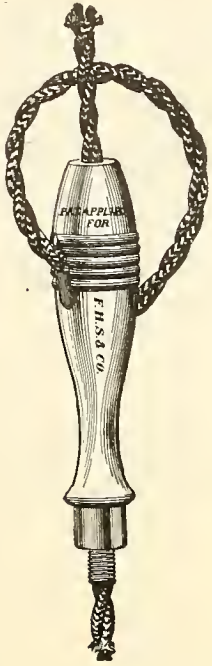
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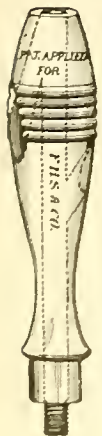
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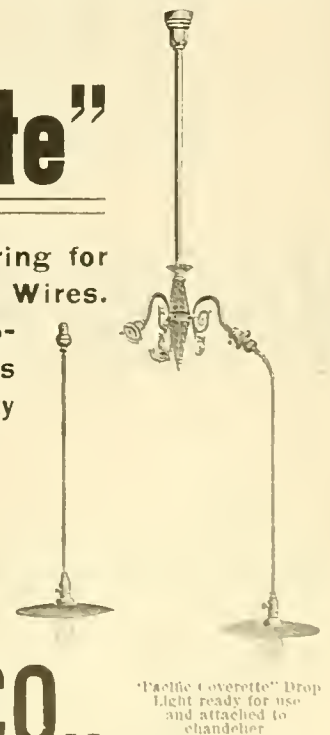
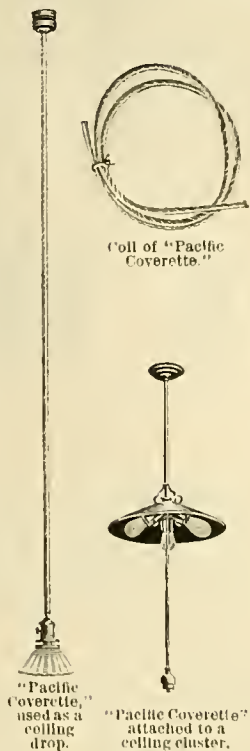
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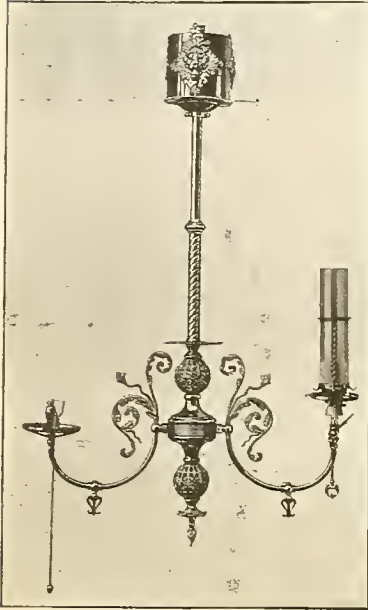
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
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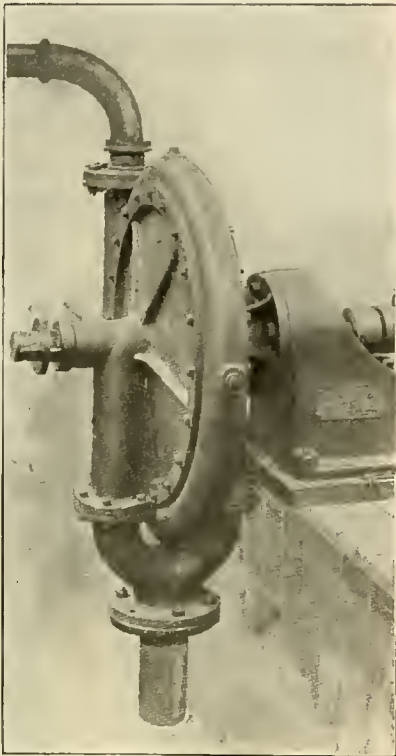
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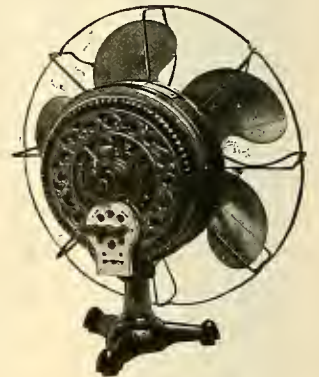
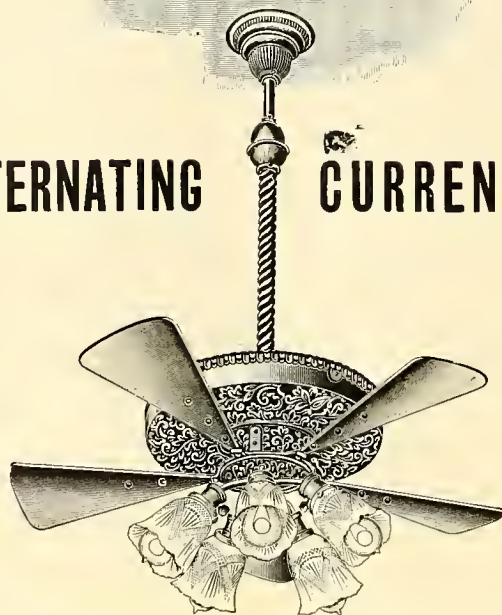
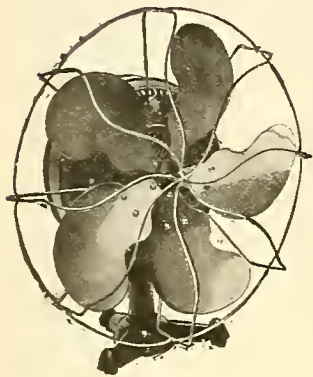
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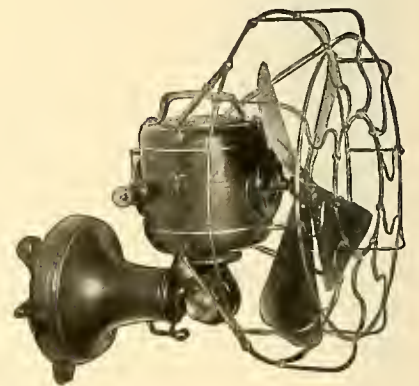
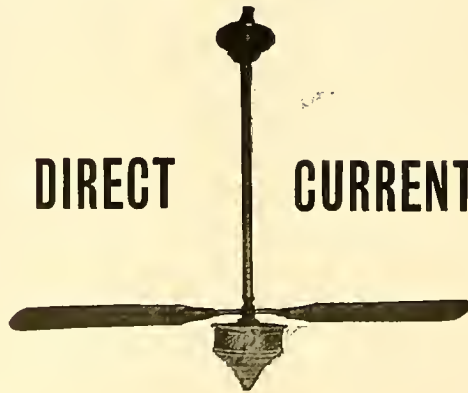
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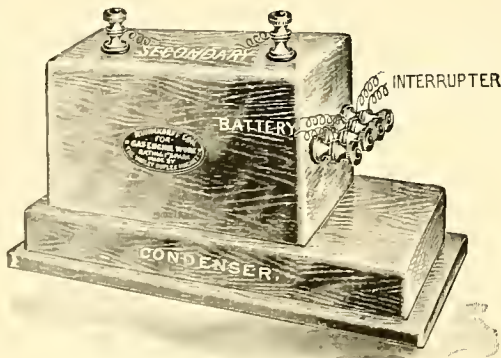
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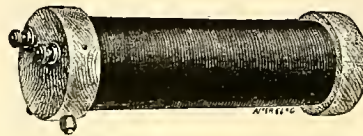
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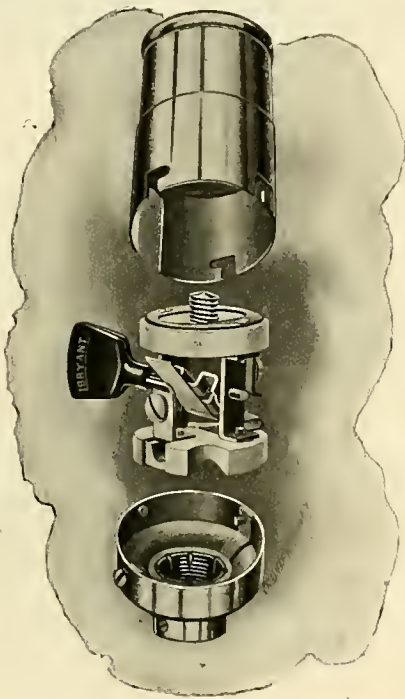
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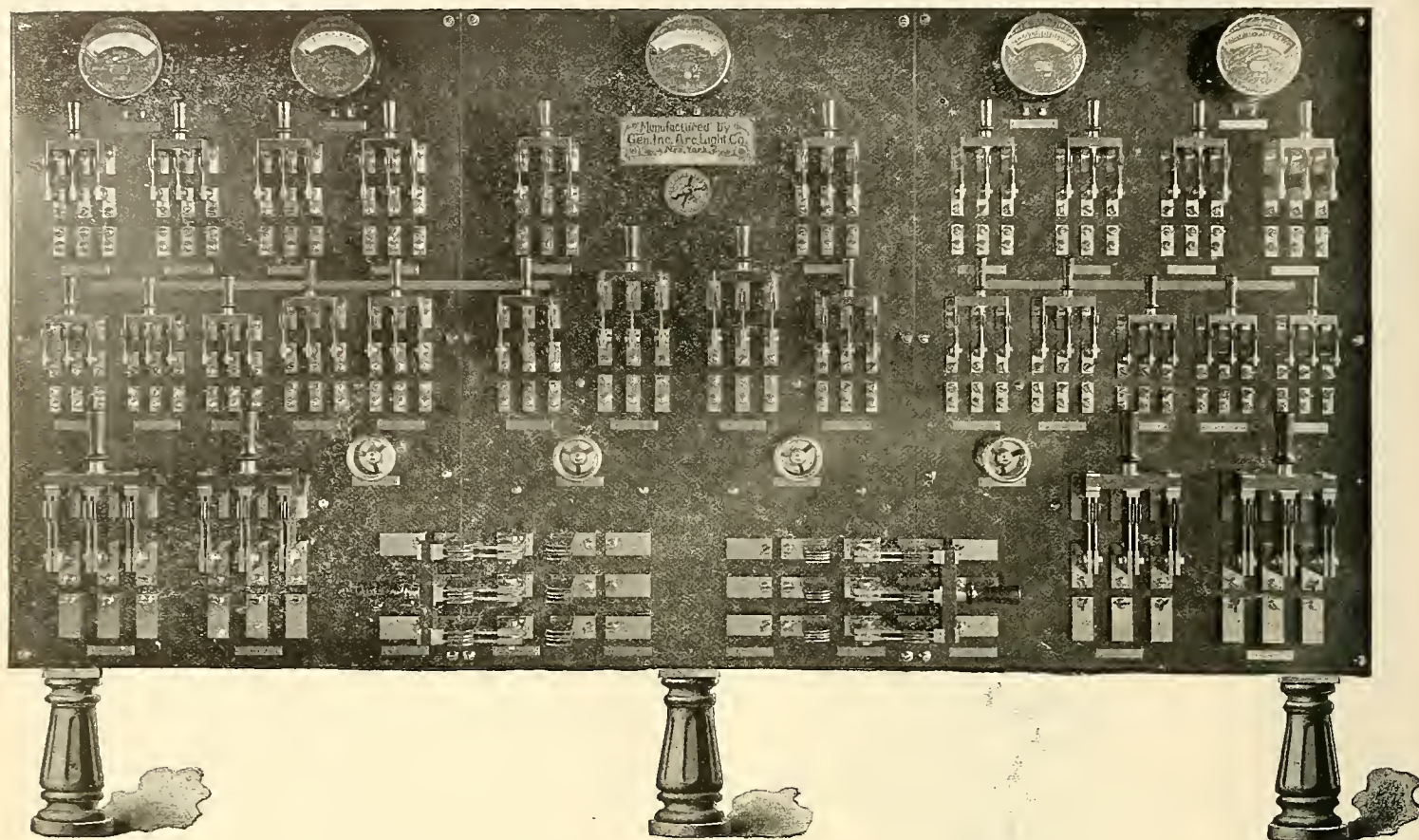
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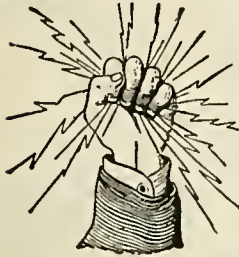
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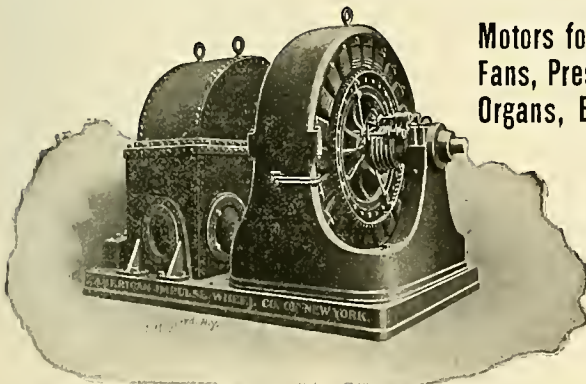
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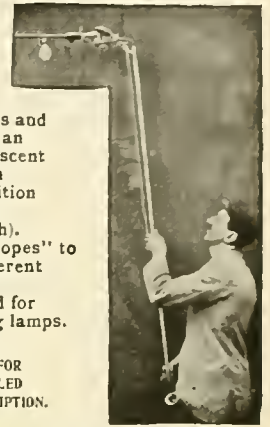
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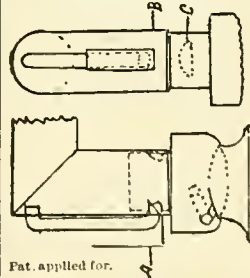
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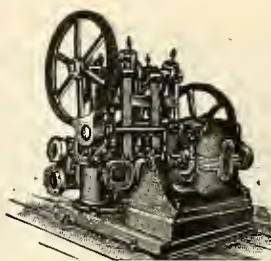
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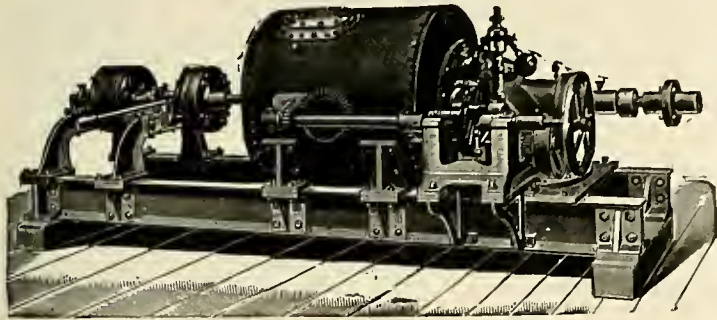
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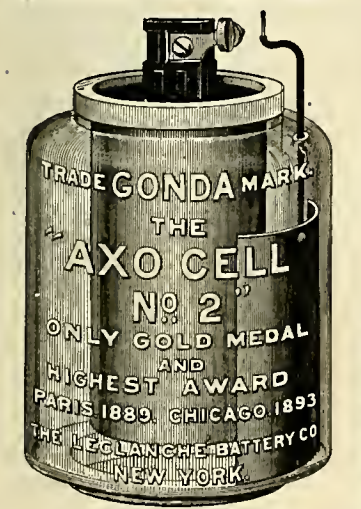
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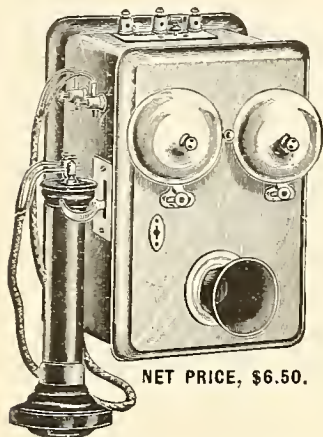
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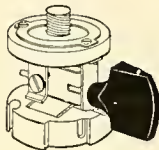
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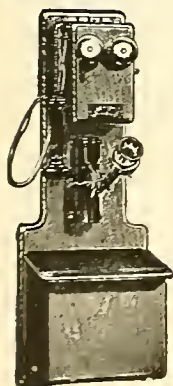
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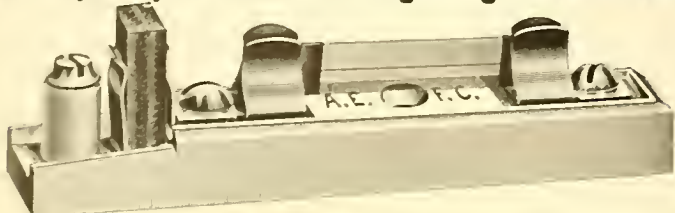
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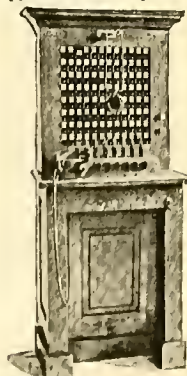
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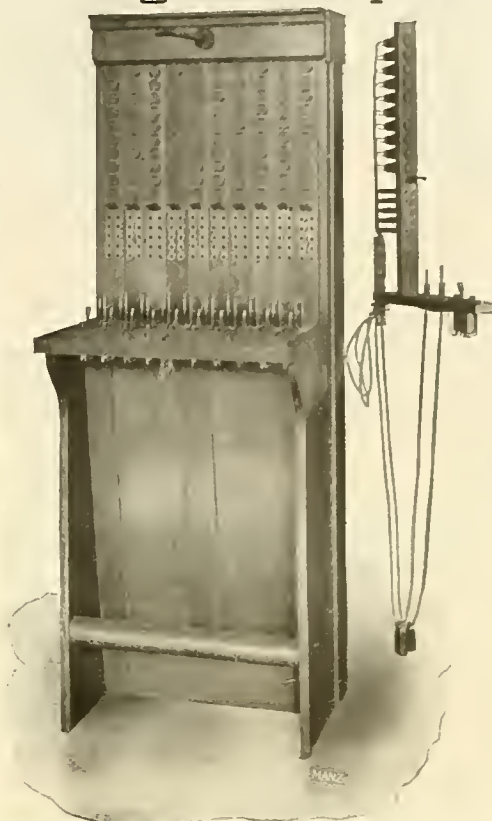
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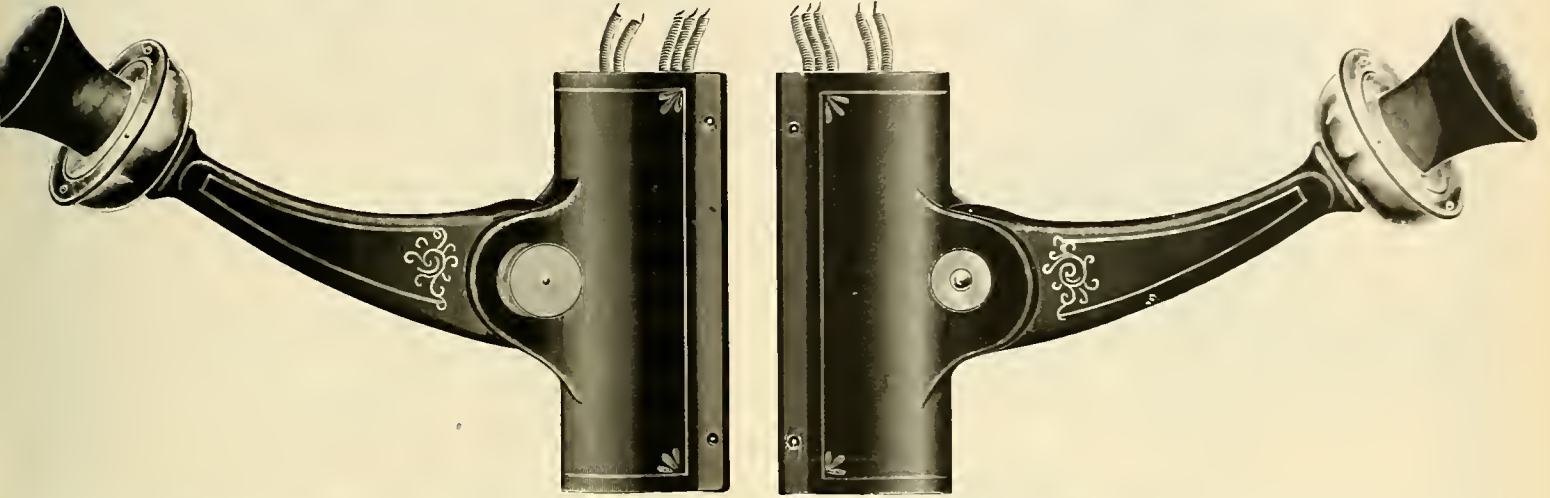
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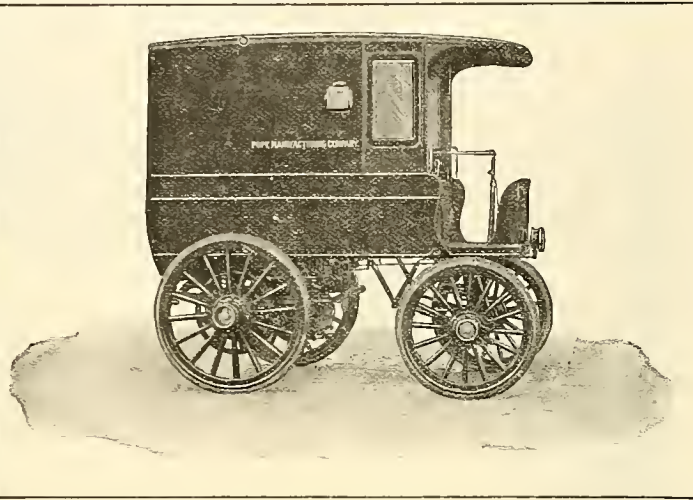
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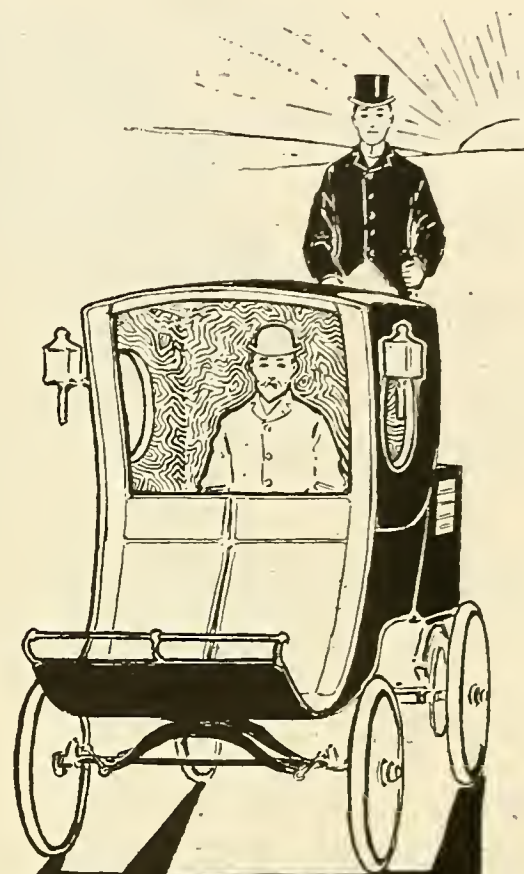
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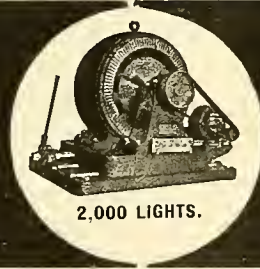
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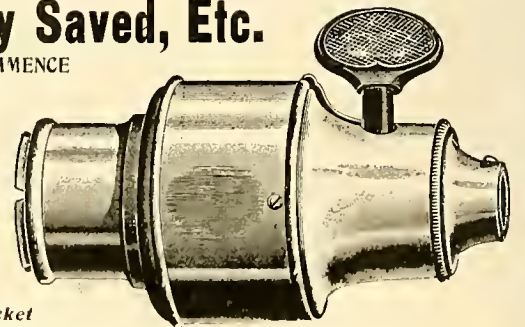
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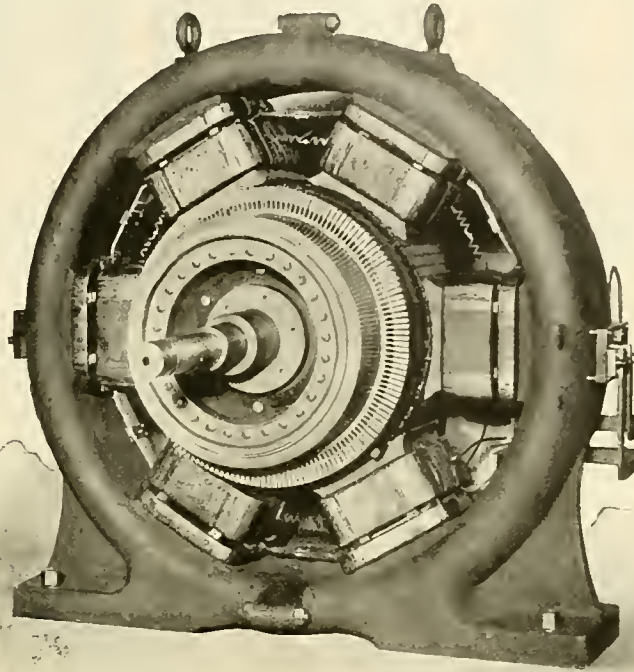
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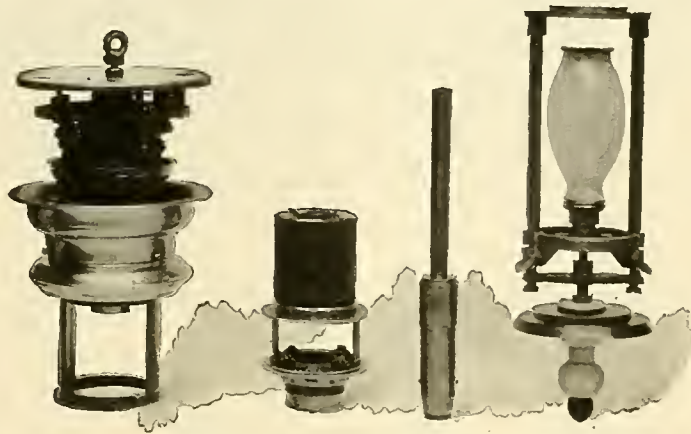
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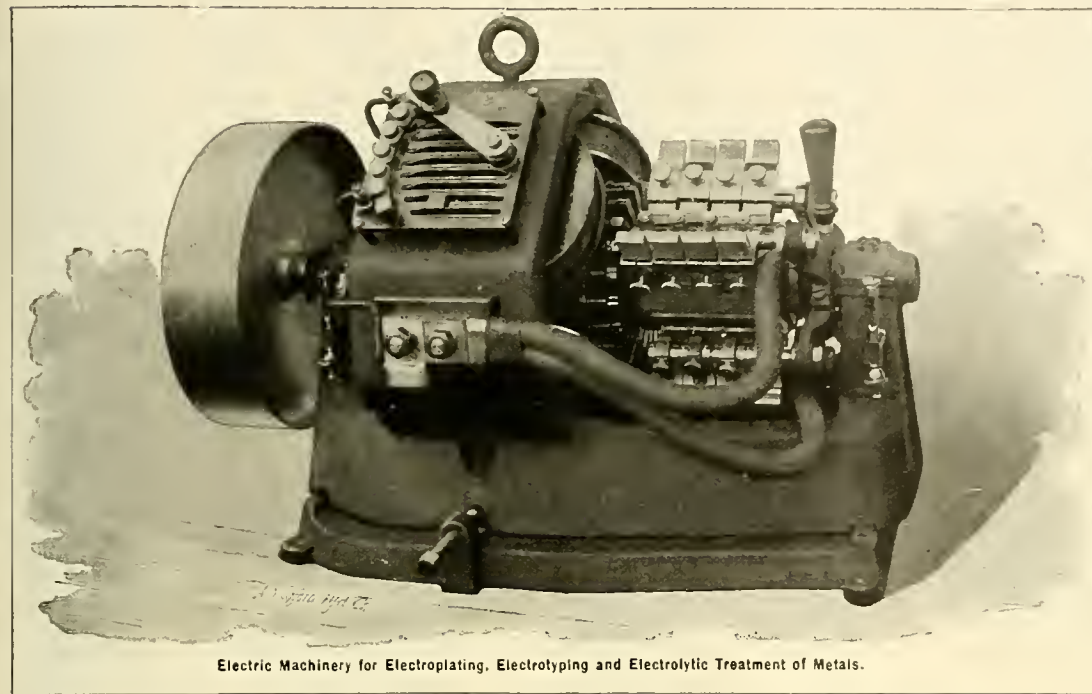
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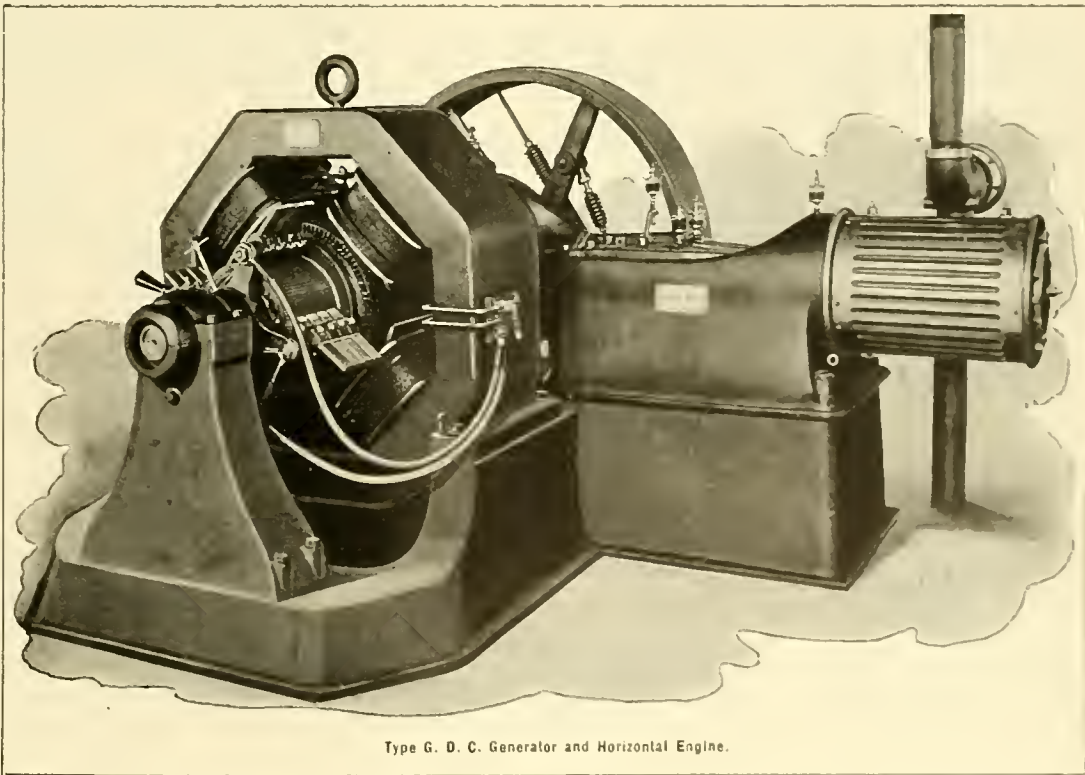
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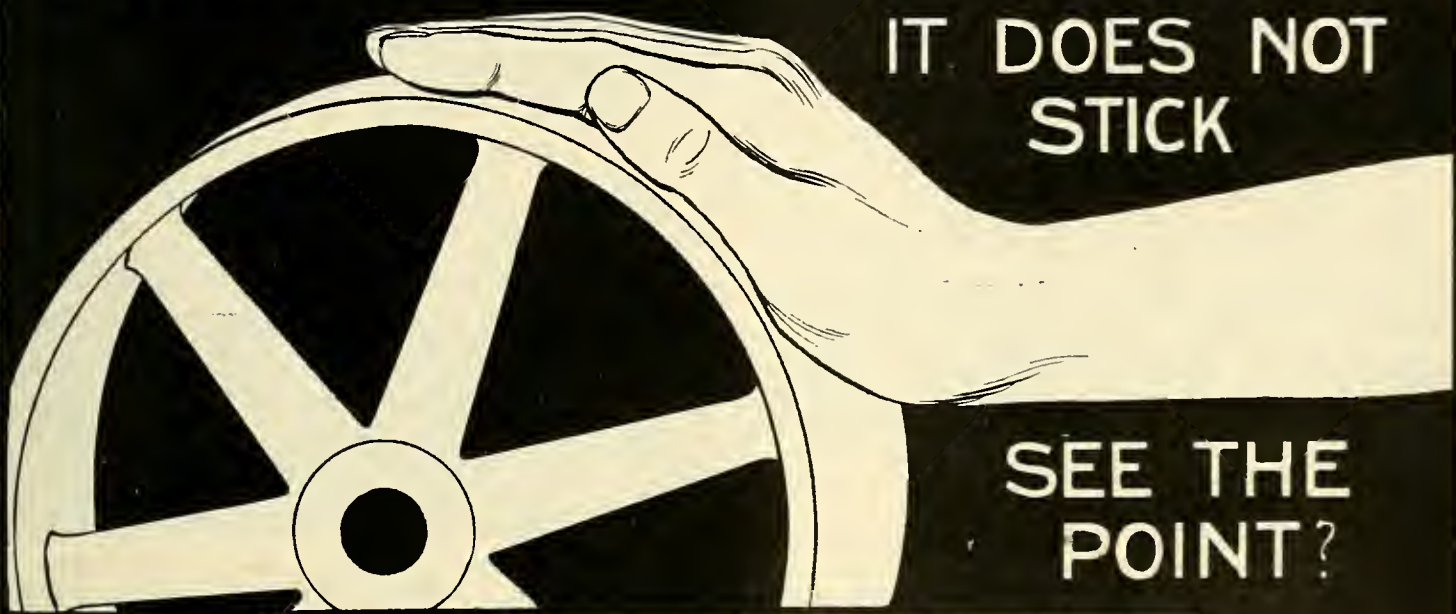
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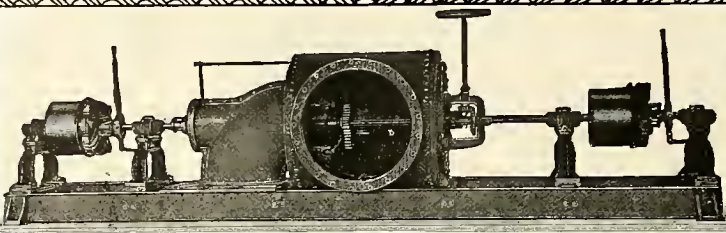
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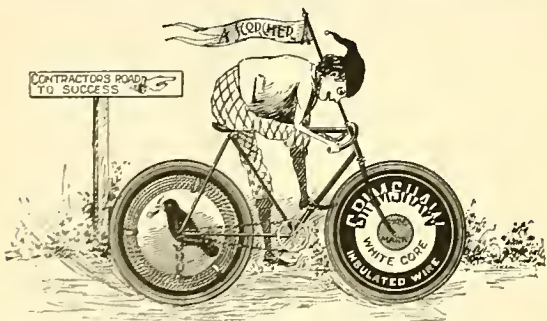
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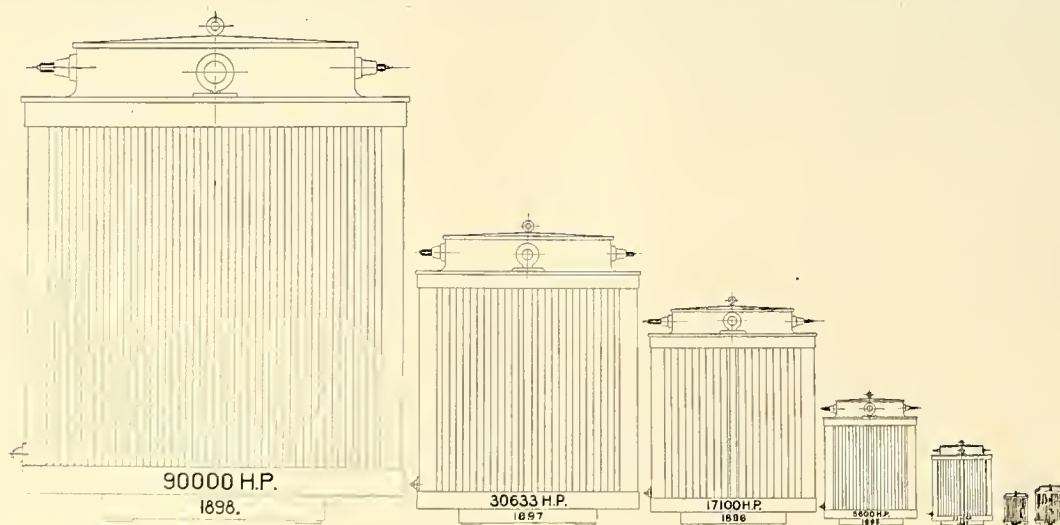
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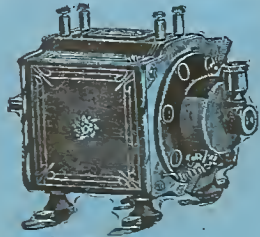
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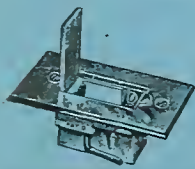
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Western Electrician

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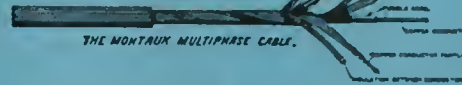
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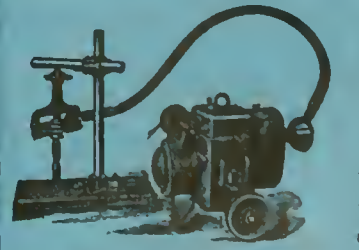
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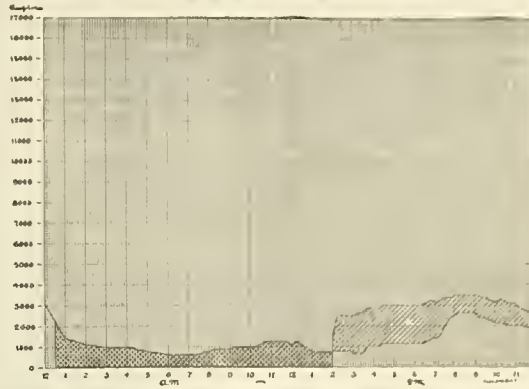
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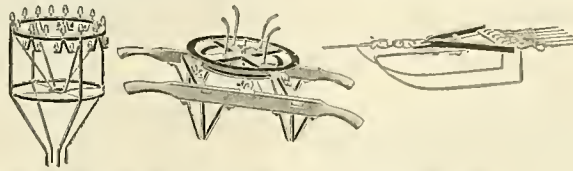


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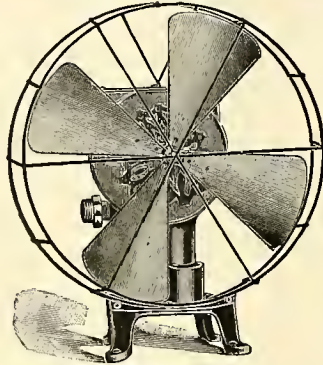
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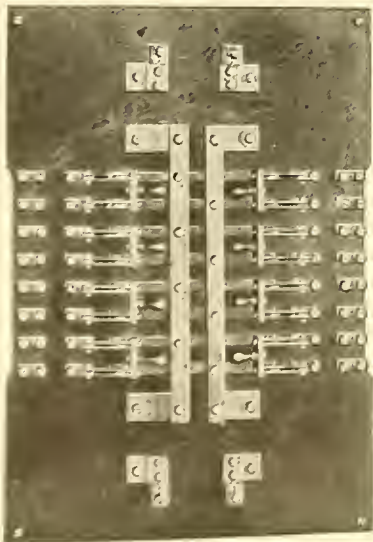
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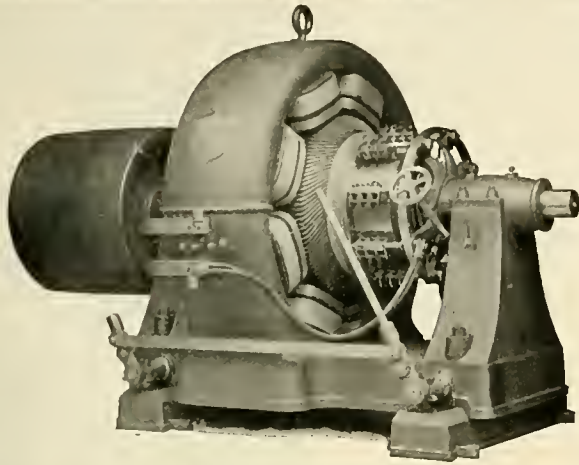
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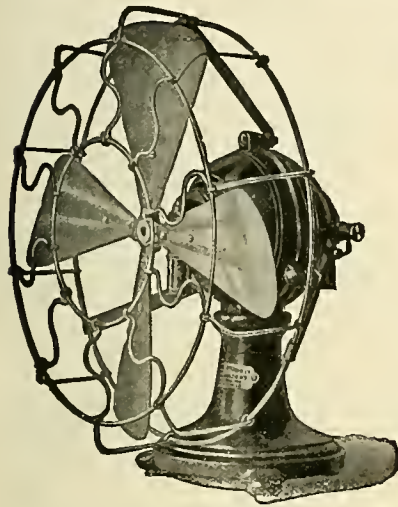
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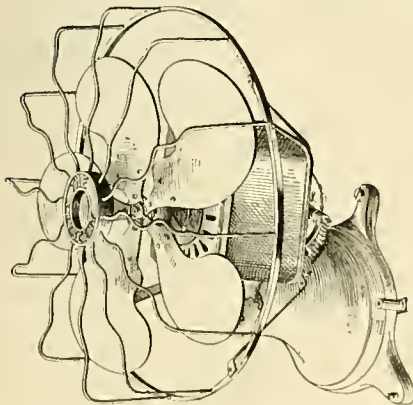
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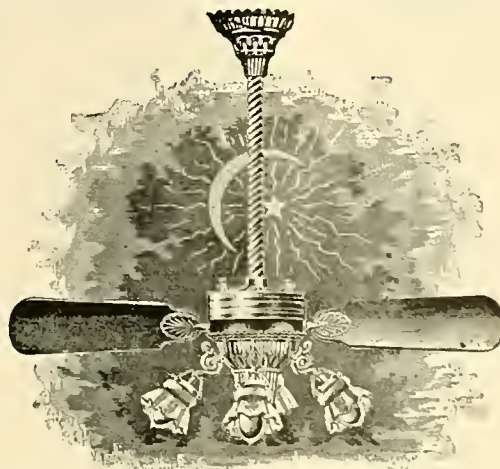
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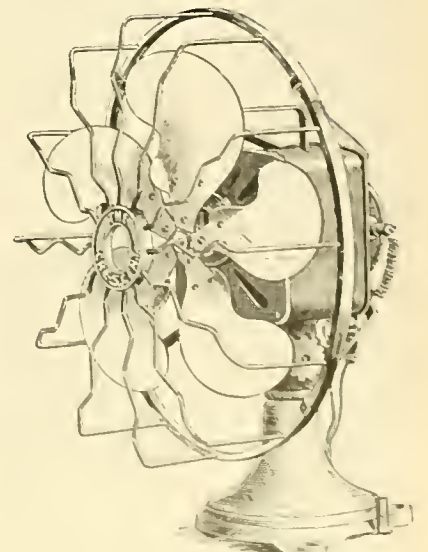
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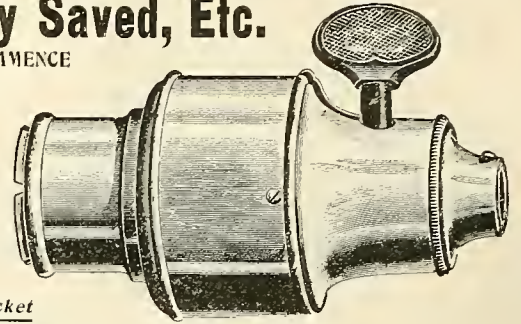
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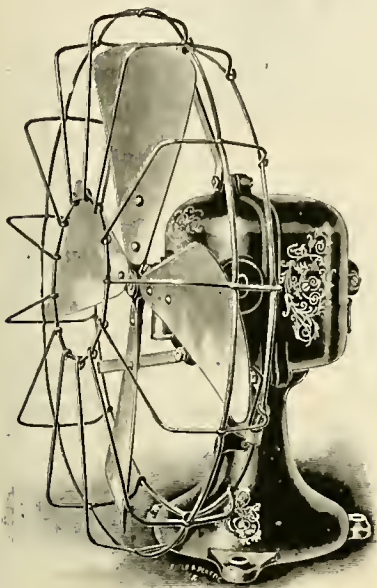
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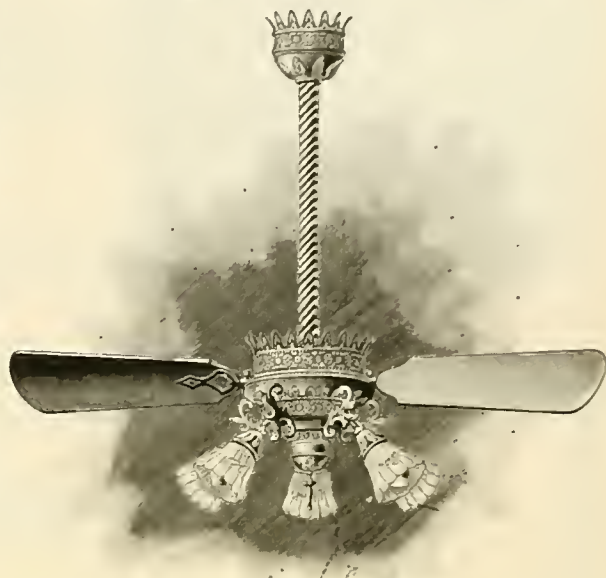
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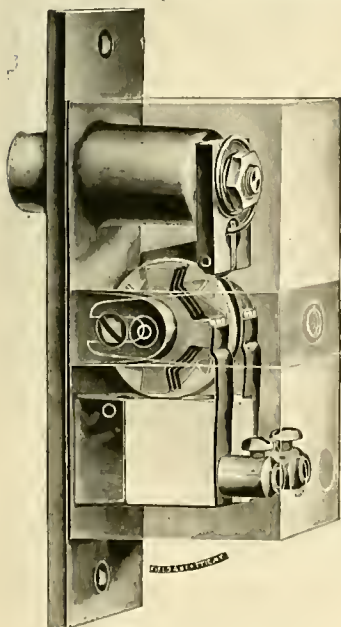
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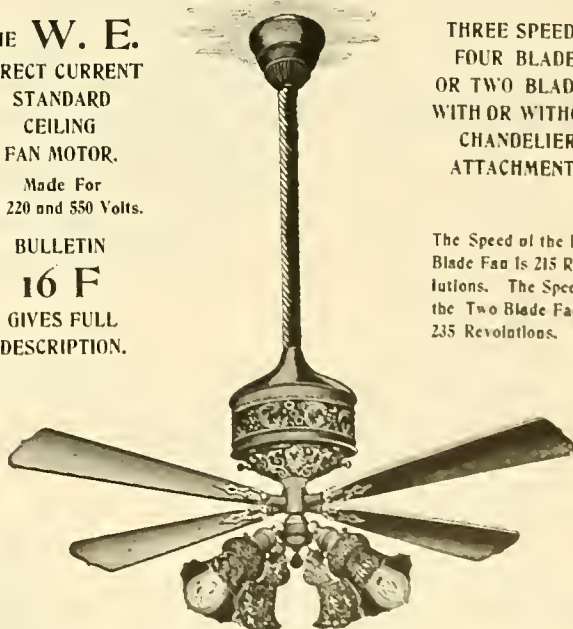
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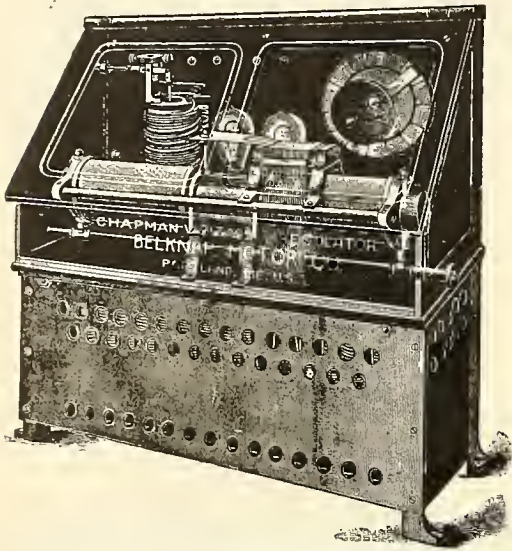
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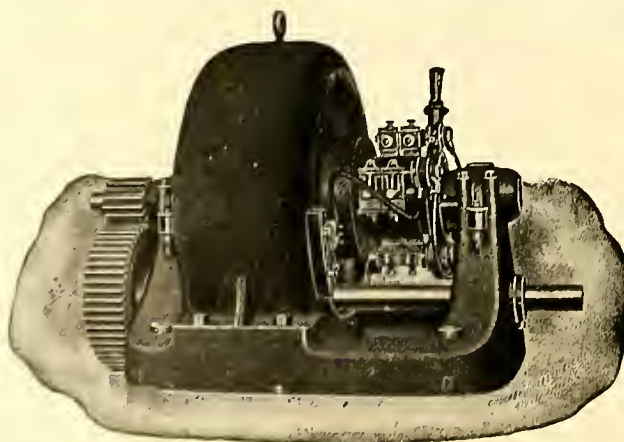
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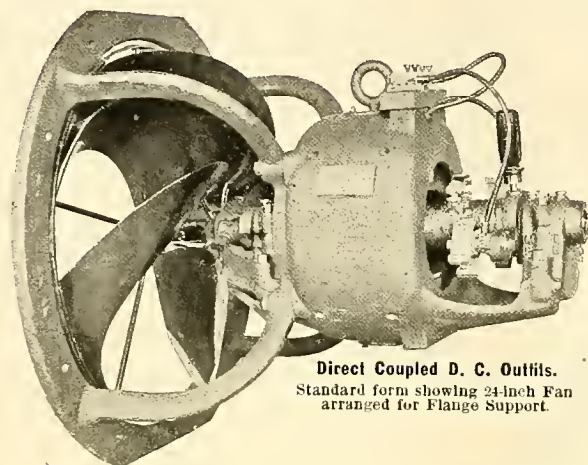
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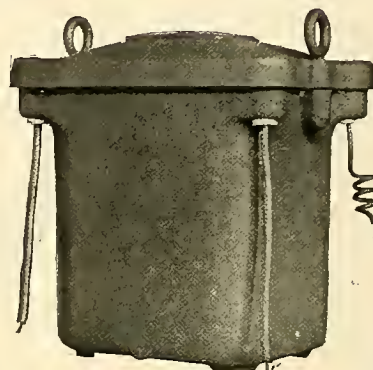
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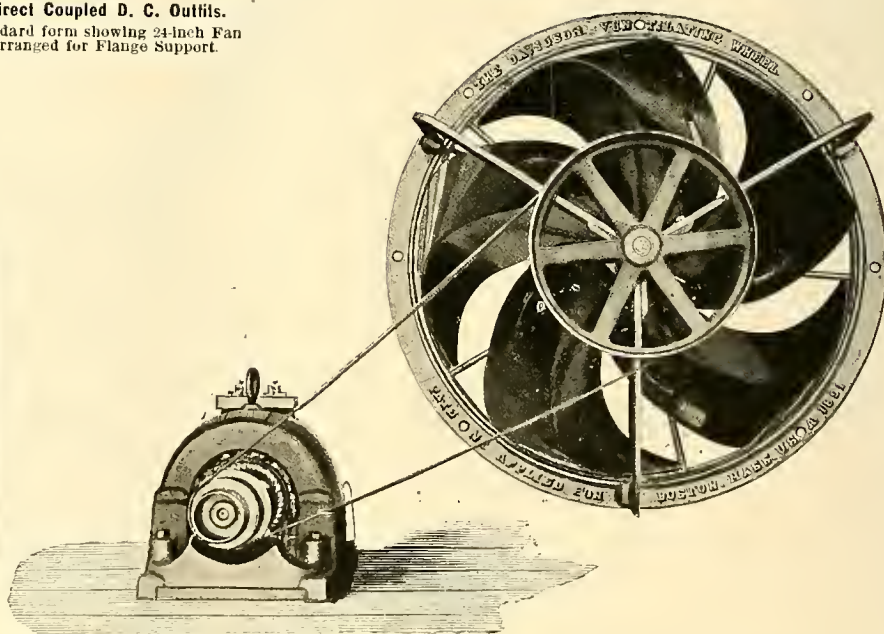
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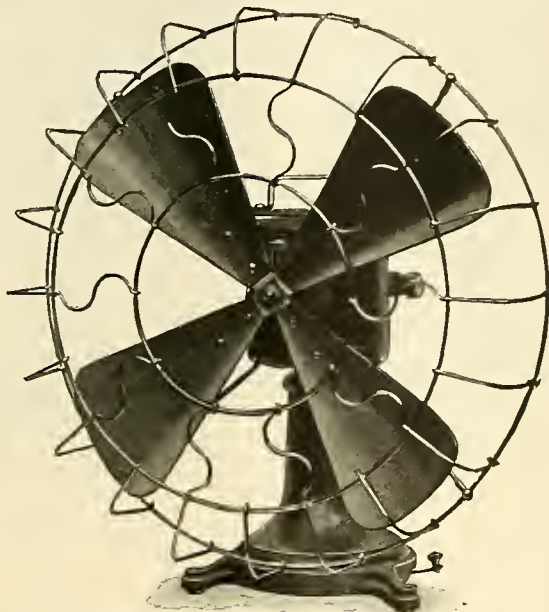
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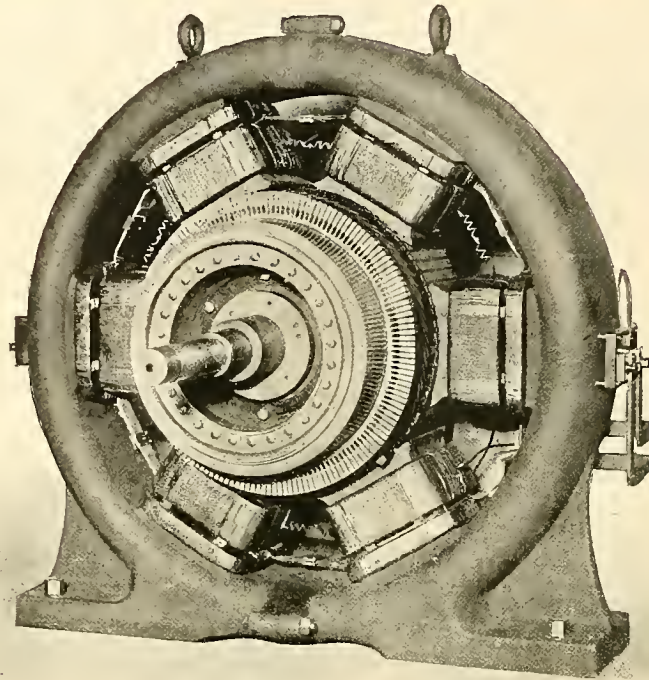
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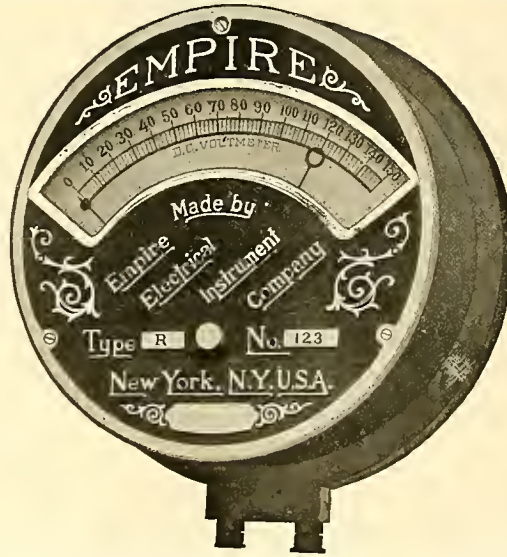


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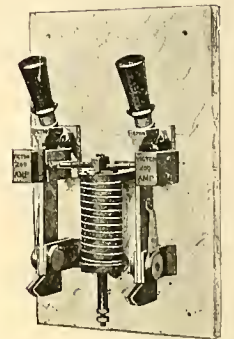
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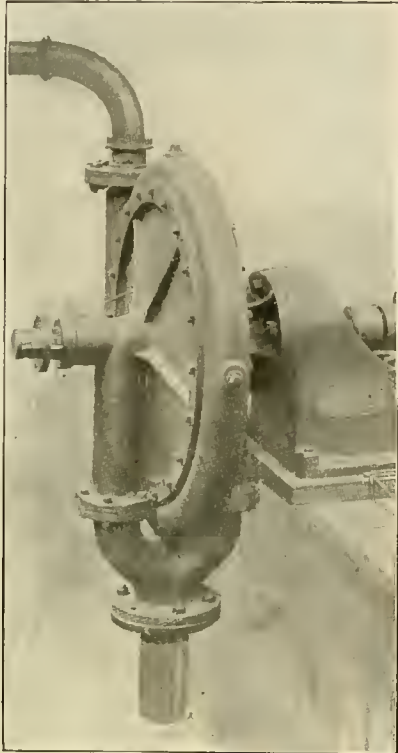
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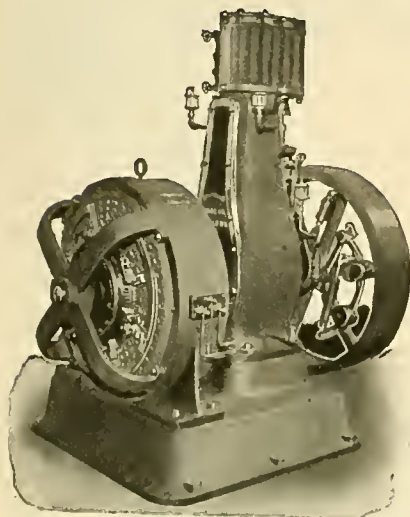
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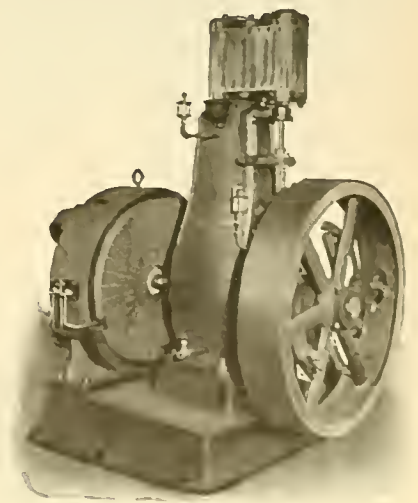
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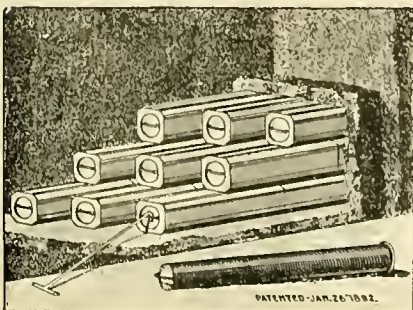


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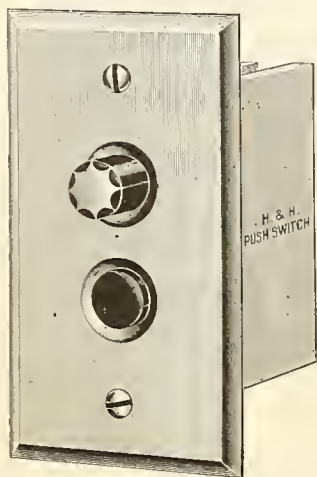
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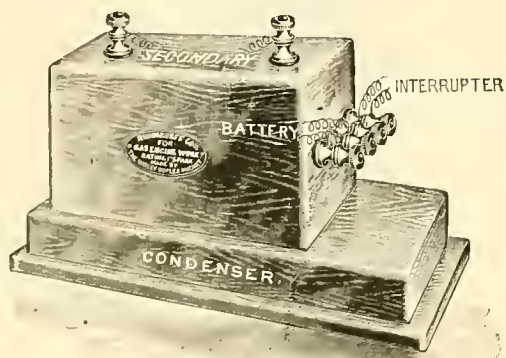
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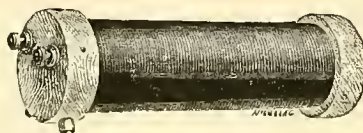
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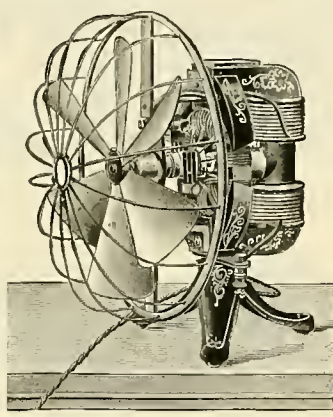
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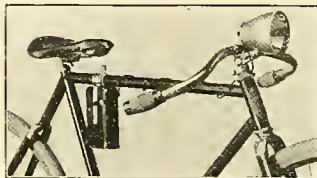
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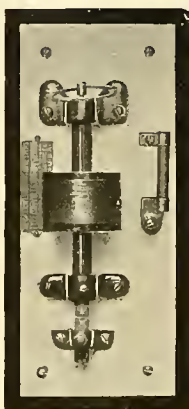
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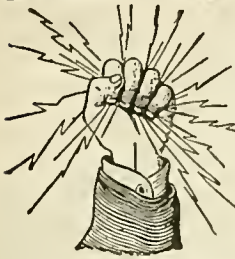
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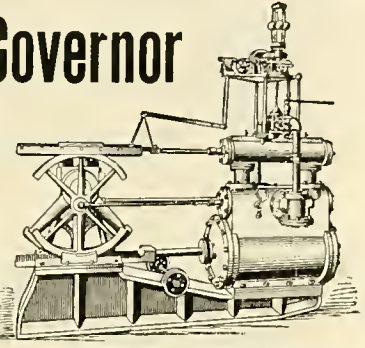
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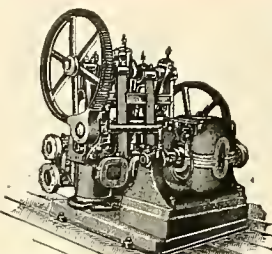
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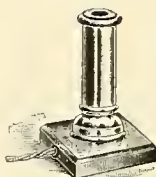
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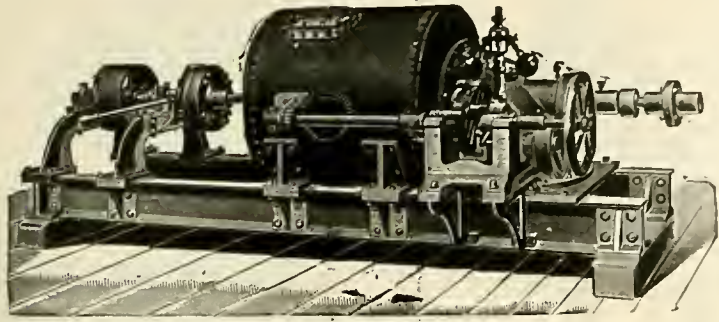
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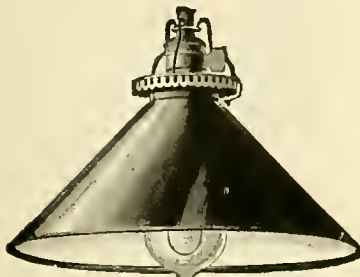
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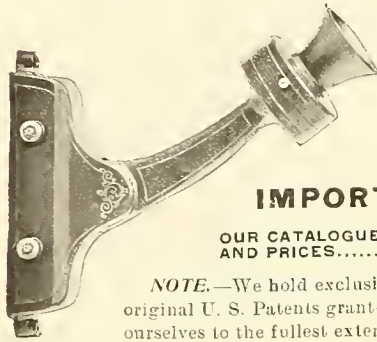
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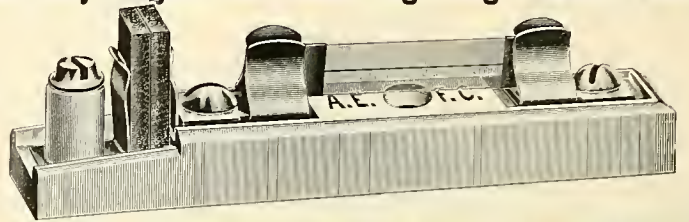


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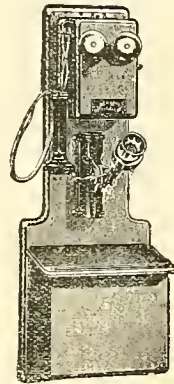
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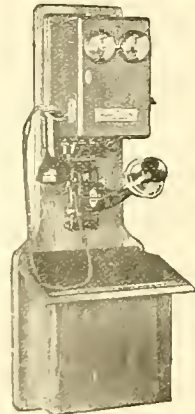
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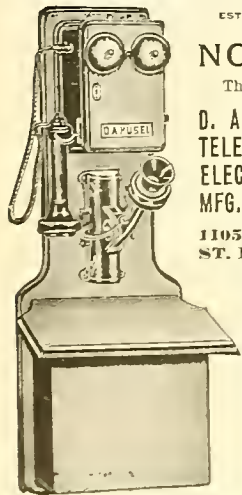
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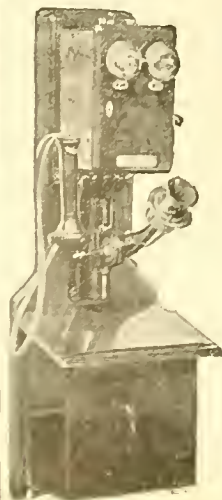
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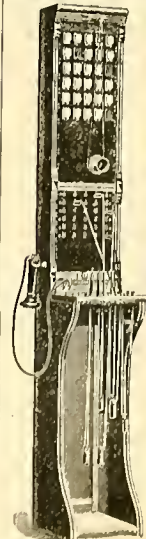
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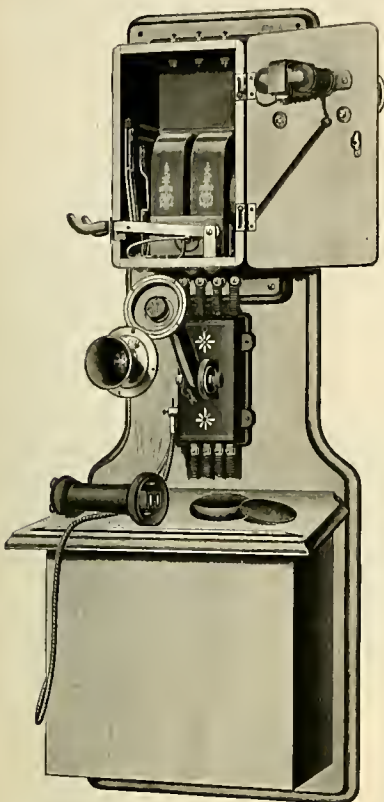
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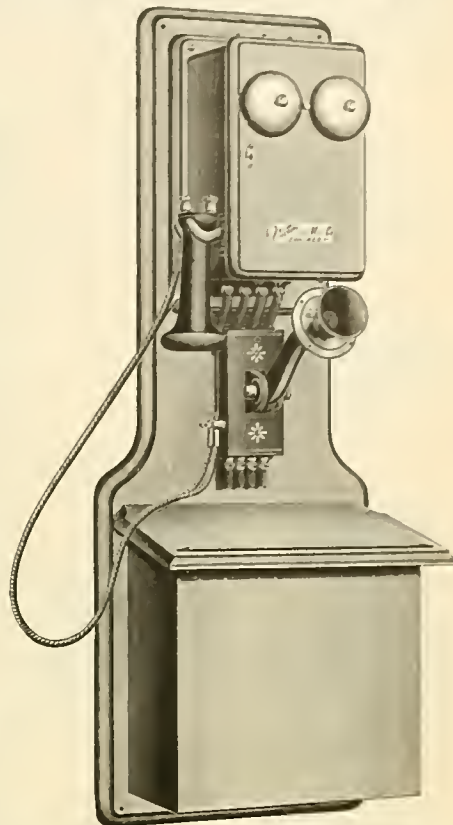
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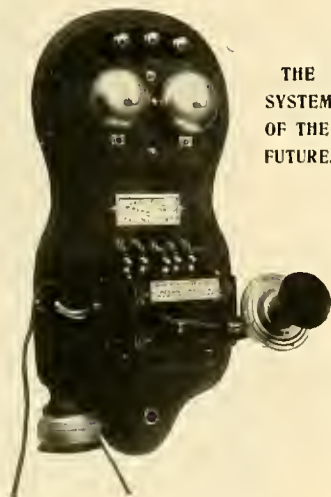
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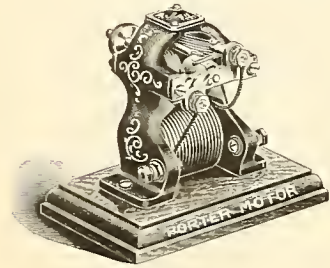
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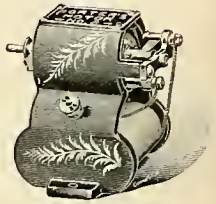
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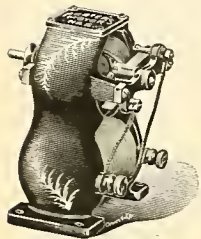


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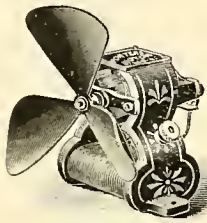
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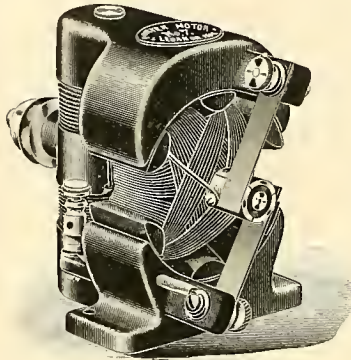
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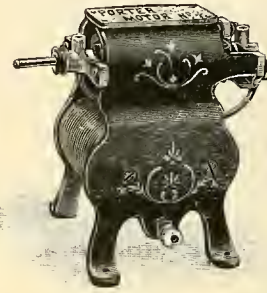
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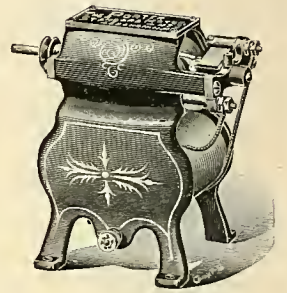
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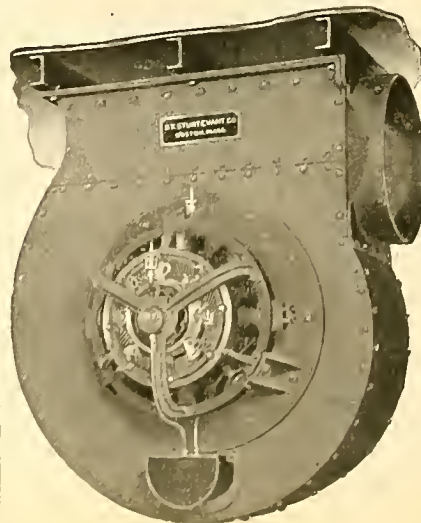
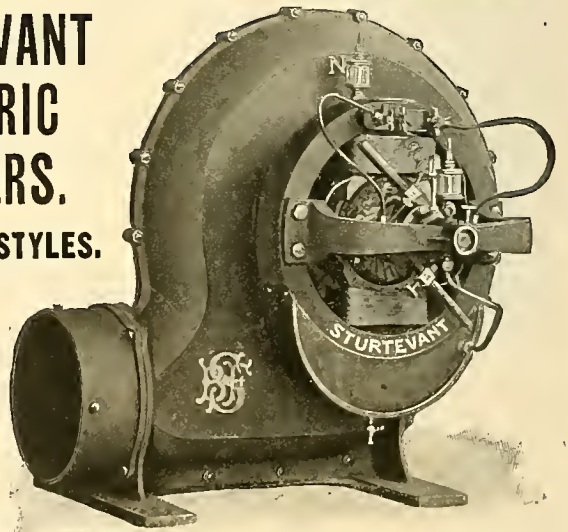
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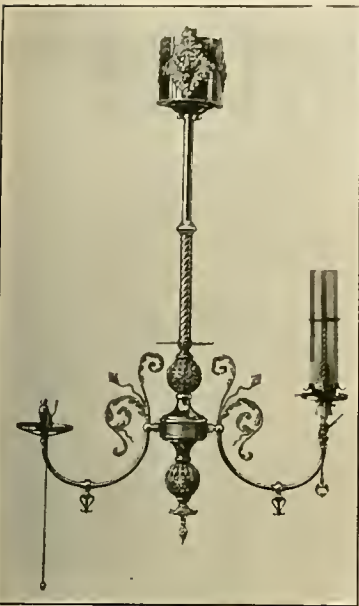
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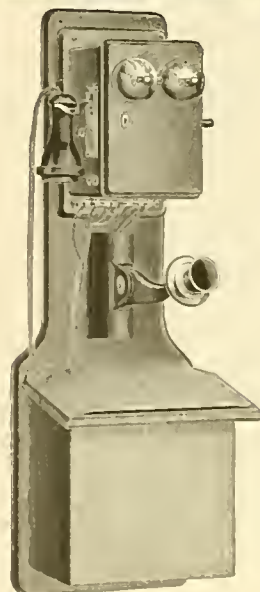
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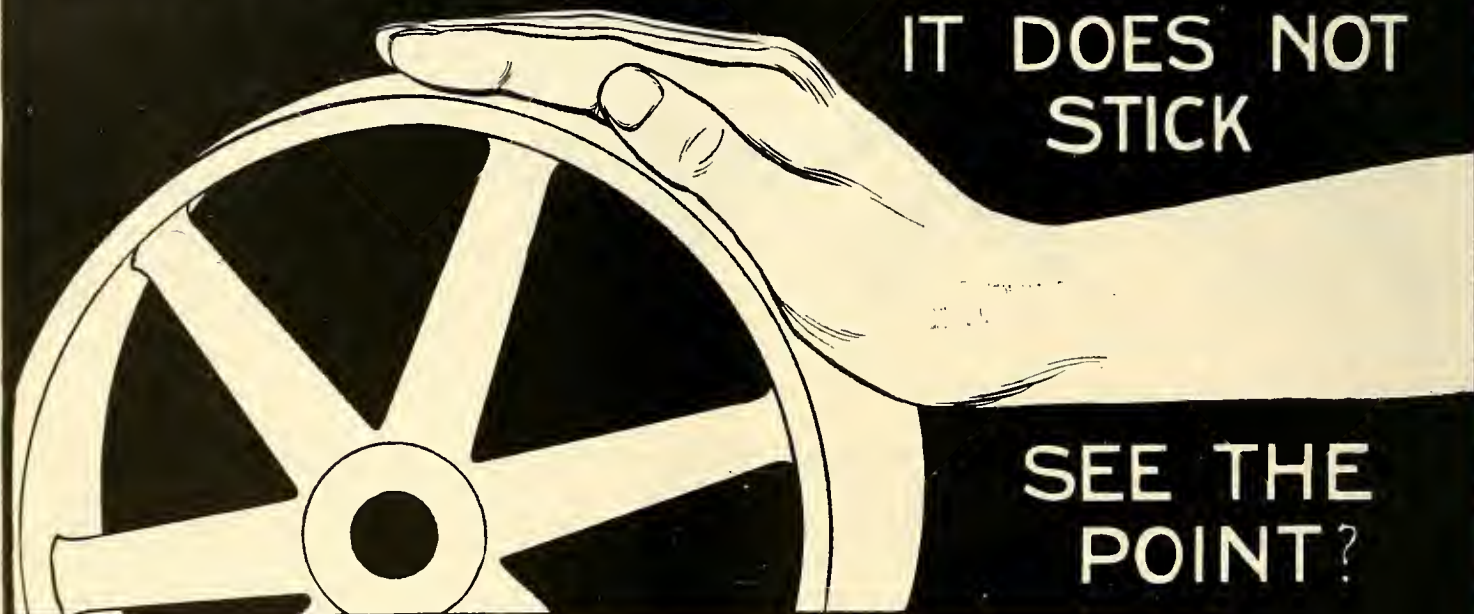
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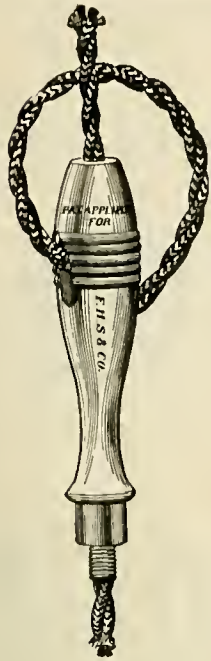
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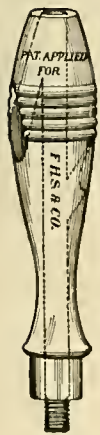
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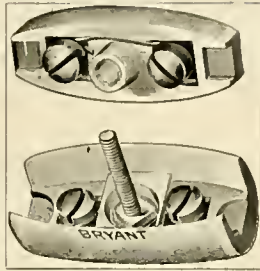


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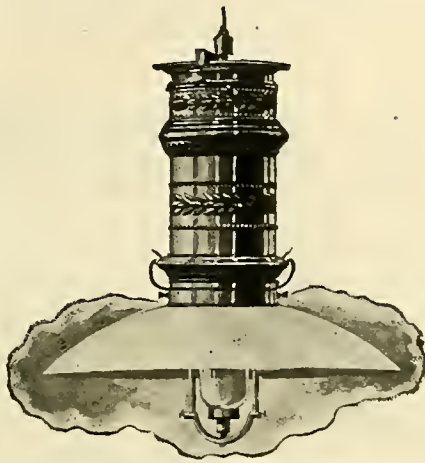
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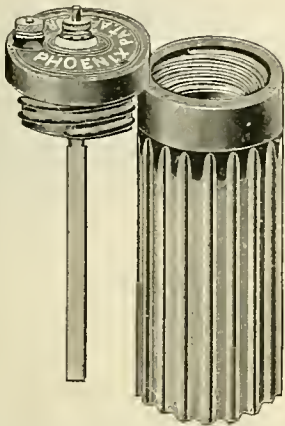
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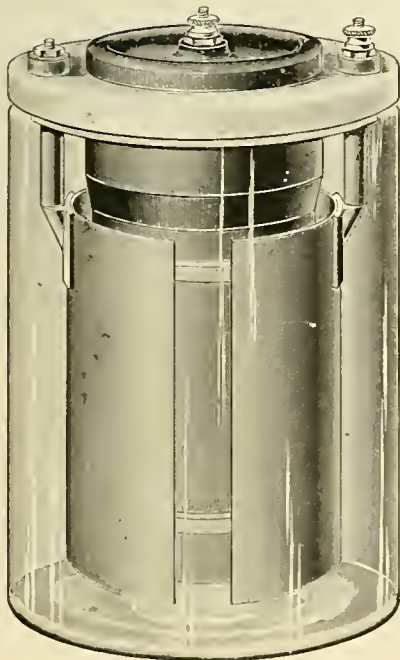
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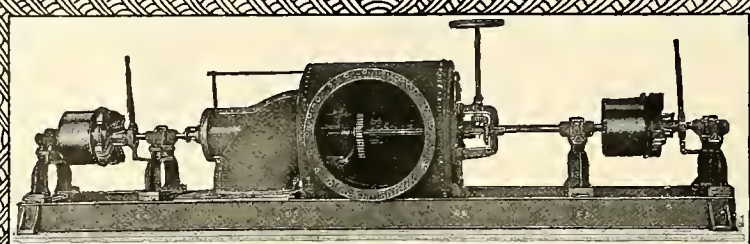
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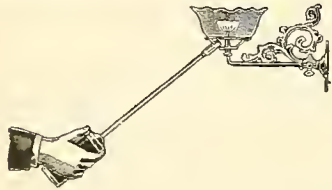
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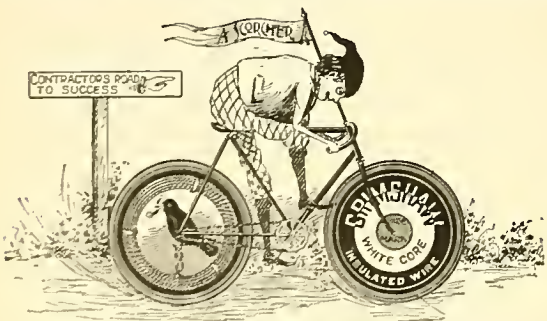
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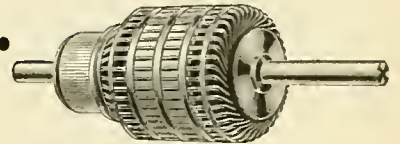
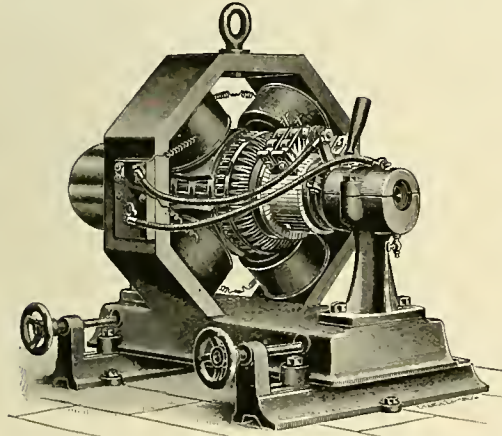
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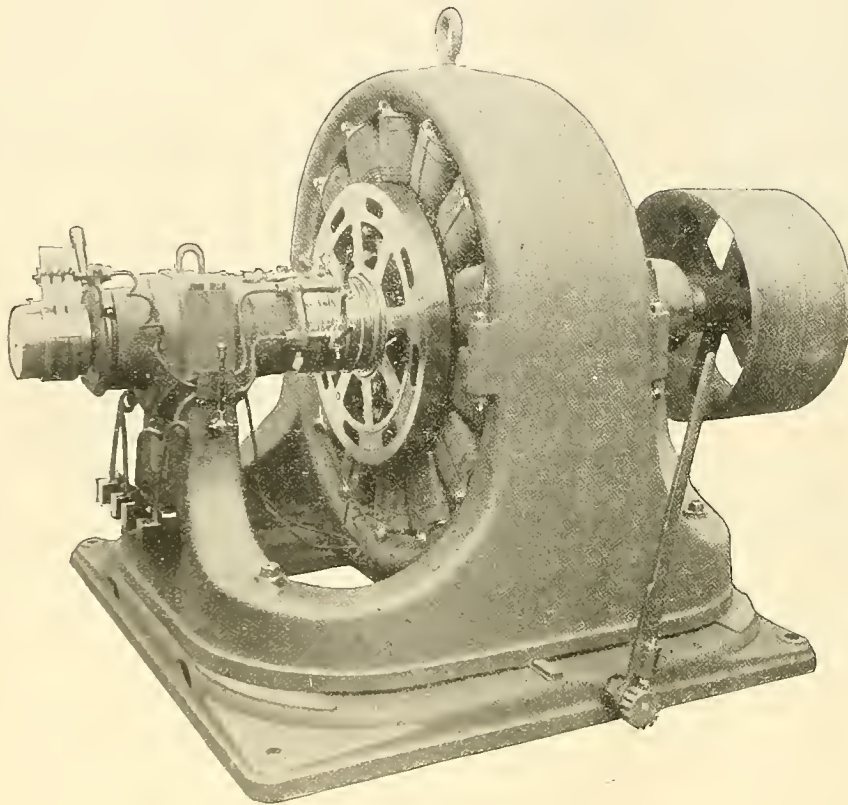
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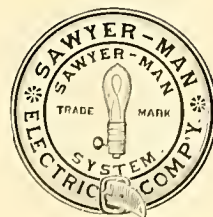
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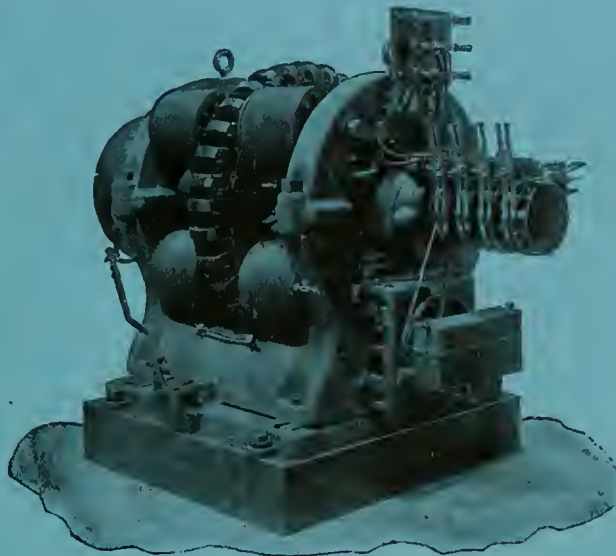
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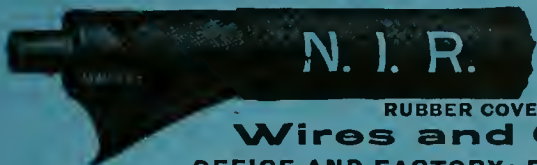
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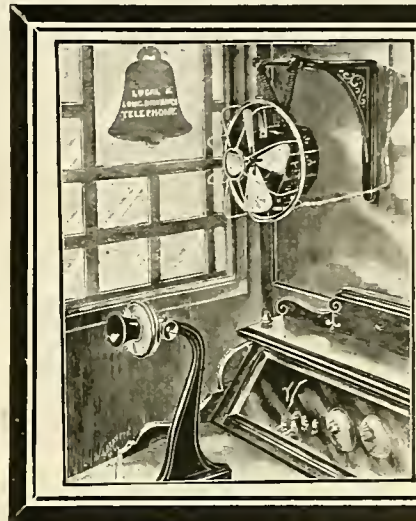
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We have the Largest and Most Complete Electrical

REPAIR SHOPS

In the West. **ELECTRICAL REPAIRS AND MACHINE WORK OF EVERY DESCRIPTION.** In having your repair work done by a company operating hundreds of dynamos and motors you are sure of good work and get the benefit of our experience.

CHICAGO EDISON COMPANY,

76 MARKET STREET, CHICAGO.

"HARDY" INCANDESCENT LAMPS.

HARDY LAMP COMPANY, PITTSFIELD, MASS.

TRIUMPH EXHAUST FAN.

Guaranteed to move

More Air,
Dust, Heat,
Steam, Etc.,
With Less
Power
Than any other
Fan.

We manufacture
all kinds
of Fans, also
Water Motors.

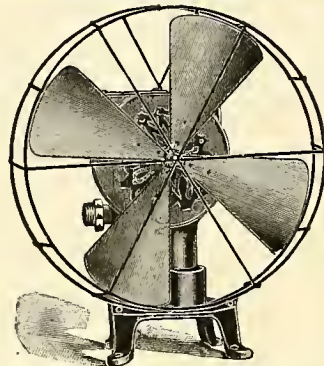


Only Successful

Water Blow
Fan.

Fits have no
use for them.

Attractive,
Efficient,
Durable,
Most Economical
Water
Consumption.



State Water Pressure.

Pat. Applied for. Price \$7.50.

Send for Catalog X.

SPECIALTY MFG. CO.,

361 to 367 S. Meridian St.,

INDIANAPOLIS, IND.

KNAPP FAN MOTOR OUTFITS WITH GORDON PRIMARY CELLS

The hot spell of summer is approaching and to those who wish to seek comfort at home or in the office, professional or mercantile, we desire to call attention to these celebrated outfits.

We guarantee the highest speed at the lowest cost for primary cells.

These fan motor outfits are manufactured in two sizes, as follows:

Type C, 8-inch Fan, with 3 No. 1A Gordon Cells.

Type E, 10-inch Fan, with 4 No. 1A Gordon Cells.

These outfits will give a life of over 150 hours without recharging, at a speed of at least 750 revolutions per minute.

For full particulars, price list, etc., address

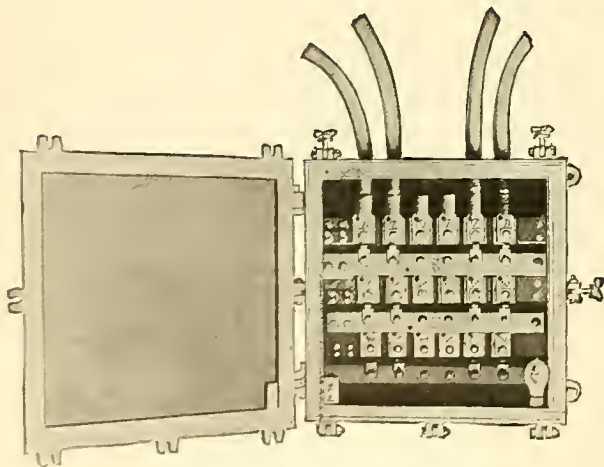
GORDON BATTERY COMPANY,

594 Broadway, New York.

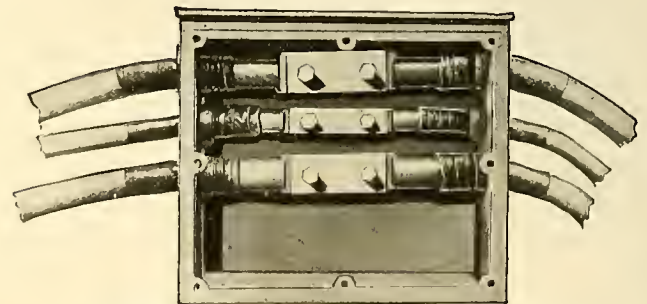
Western Representative, GEORGE W. PATTERSON, 1539 Marquette Bldg., Chicago, Ill.



G. I. UNDERGROUND MATERIAL.



Tailleir Service Boxes.
Tailleur Coupling Boxes.



Tailleir High-Tension Coupling Joints.
Tailleur Junction Boxes.

PARACON FANS AND WRIGHT METERS.

General Incandescent Arc Light Co.,

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233 Drexel Building.

CLEVELAND,
39-47 E. Prospect Street.

SAN FRANCISCO,
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CHICAGO,
1012-13 Monadnock Block.

MARTIN J. INSULL CO.:
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511 Security Building.

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516 Guaranty Building.

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700 Pabst Building.

To Telephone and Telegraph Without Wire

Is a fact in lighthouse communication, laboratory practice and convention entertainment. However, there has been neither a drop in prices nor a market surplus of copper and iron wire as a result of lessened demand.

Only with the greatest difficulty do we maintain full lines of **OKONITE**, **BANNER WEATHERPOOF**, **BARE COPPER AND IRON WIRE**, and we give due credit (as also do our customers) to our happy faculty of discounting the market and trade conditions.



CENTRAL ELECTRIC COMPANY,

264, 266, 268, 270 FIFTH AVENUE, CHICAGO.



SOUTHERN ELECTRICAL SUPPLY CO., St. Louis.

ESTABLISHED 1878.

J. H. BUNNELL & CO.,

76 CORTLANDT STREET, CORNER WASHINGTON STREET,
...NEW YORK...

We Are Here to Fill Orders for Everything Electrical at Right Prices.

Prompt attention given to all inquiries and orders. We shall continue to deserve the honored distinction of being the makers of the **BEST TELEGRAPH INSTRUMENTS ON EARTH**. They are the acknowledged Standard of the World. We have just issued a new Telephone Catalogue and Manual of Telegraphy. Send for a copy, and mention this paper.

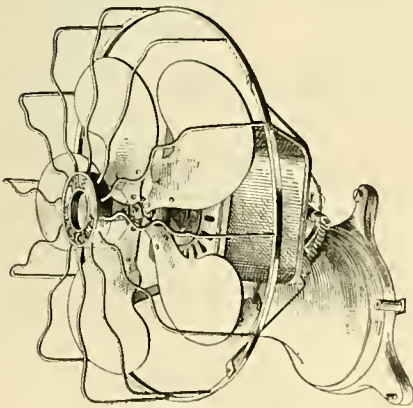
J. H. BUNNELL & COMPANY,

76 Cortlandt Street, Cor. Washington, NEW YORK.

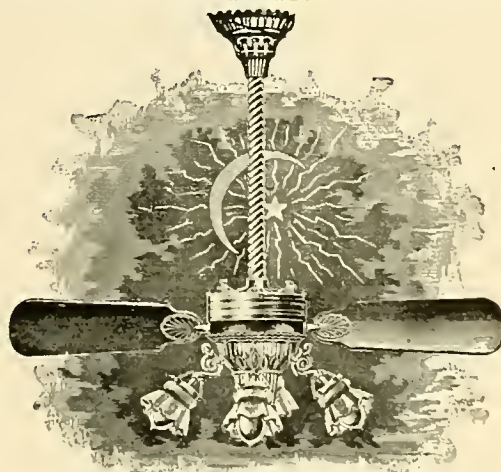
CRESCENT FANS

WOUND FOR ANY VOLTAGE DIRECT CURRENT

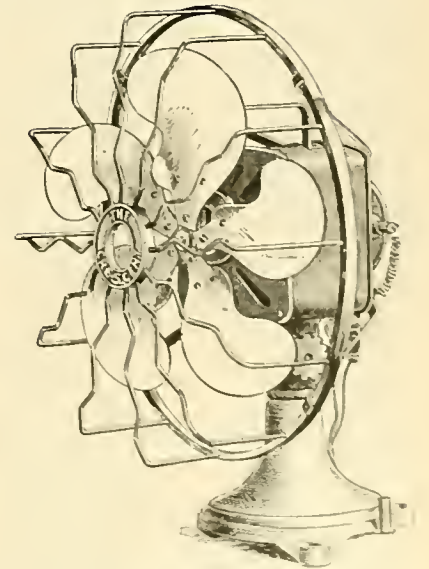
PATENTED.



Wall Bracket Fan.



Crescent Fan with Four-Light Fancy Electroler.



New Crescent Desk Fan.

2,500 OF THESE FANS JUST SHIPPED

St. Louis, to Our Exclusive Western Agents,

A. RIEMANN & CO., Successors to **A. C. Wolfram Electric Co.,** 824 Market Street.

THE DAYS OF TIGHT BELTS ARE OVER.

See Our Exhibit at the Electrical Exhibition,
Madison Square Garden, New York.

A Slack Belt with CLING-SURFACE On It, and a Tight Belt Without It.

CLING-SURFACE MFG. CO., 177-182 VIRGINIA ST., BUFFALO, N. Y.

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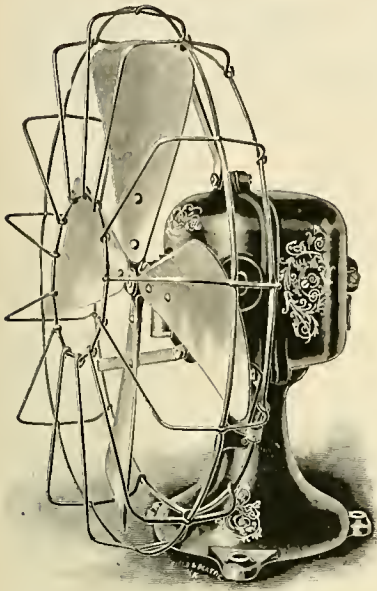
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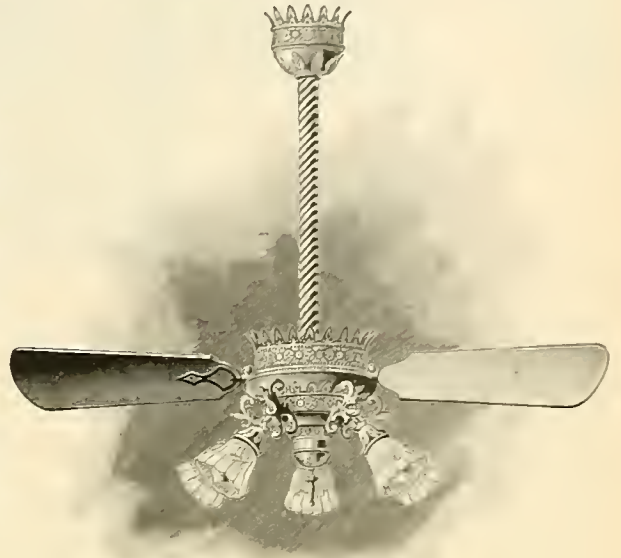
DIEHL ELECTRIC FANS,

FOR ALL CIRCUITS, EXCEPT ALTERNATING.



Our line of Electric Fans for ALL purposes for the present season is the most complete that we have ever placed in the market, and the high standard of our product has been strictly upheld.

Our fans are the cheapest because they are absolutely the best made: wear longest, require less outlay for repairs and show a higher efficiency than any other fan. This statement is fully sustained by the past record of our fans. Our place has always been in the lead and we intend to maintain that position.



SEND FOR CATALOGUE.

DIEHL MANUFACTURING CO.

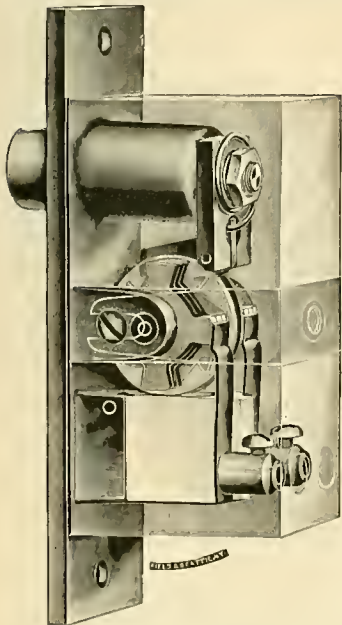
SHOW ROOMS { 561-563 Broadway, NEW YORK.
192-194 Van Buren St., CHICAGO.
128-132 Essex St., BOSTON.

MAIN OFFICE AND WORKS:

ELIZABETHPORT, N. J.

THE ECO DOOR SWITCH

Makes Contact Every Other Time.



Approved by
National Board
of Fire
Underwriters.

When the Door is Shut—
NO LIGHT!
Open It to Go In—
LIGHT!
Shut It After You Are In—
STILL LIGHT!
Open It To Go Out—
NO LIGHT!
Shut It After You Are Out—
STILL NO LIGHT!

Size over all, 3 1/4 inches long, 1 inch wide, 1 5/8 inches deep.

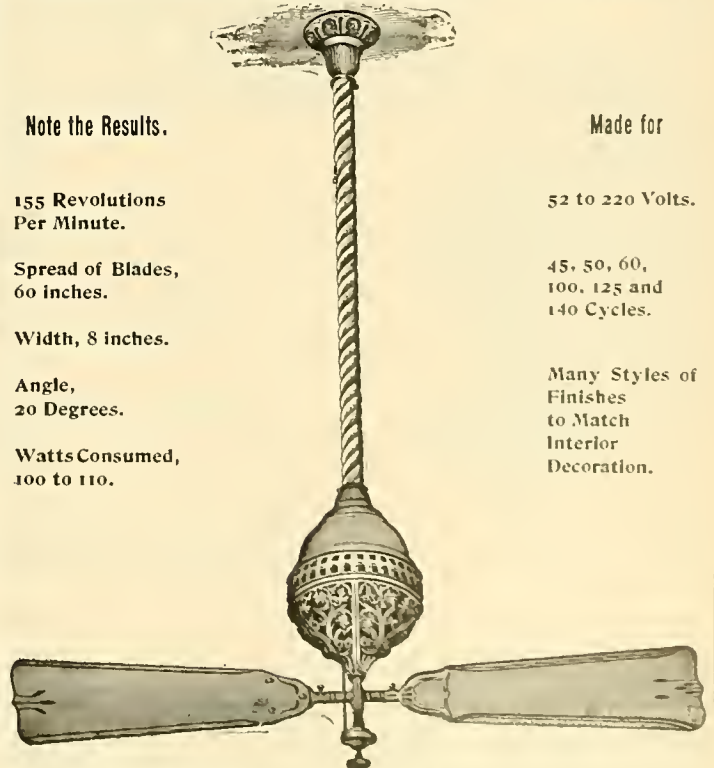
EDWARDS & CO.,

NEW YORK, N. Y., U. S. A.

A. LÜNGEN.

SEND FOR FAN MOTOR CATALOGUE.

TUERK ALTERNATING CURRENT CEILING FAN.



Note the Results.

Made for

155 Revolutions
Per Minute.

52 to 220 Volts.

Spread of Blades,
60 inches.

45, 50, 60,
100, 125 and
140 Cycles.

Width, 8 inches.

Angle,
20 Degrees.

Watts Consumed,
100 to 110.

Many Styles of
Finishes
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Telegraph Station and Measuring Instruments,
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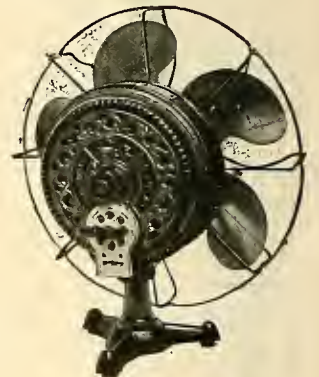
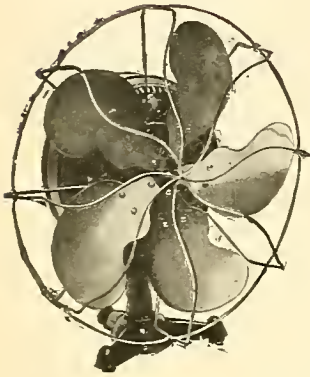
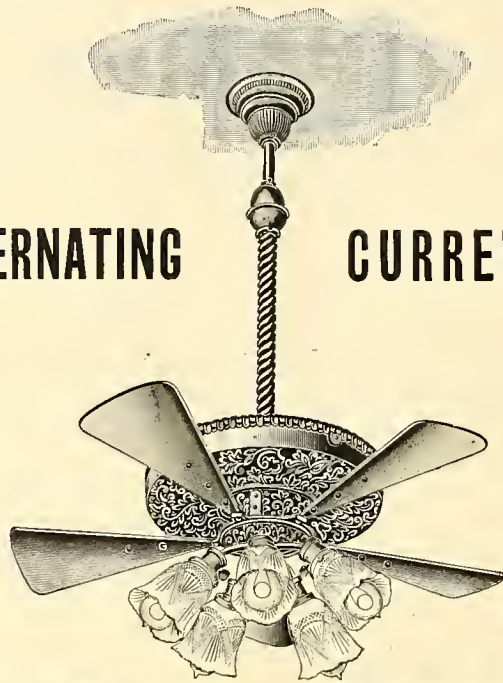
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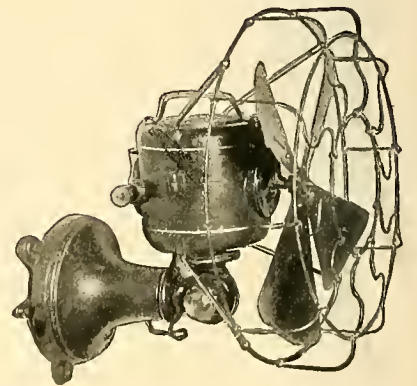
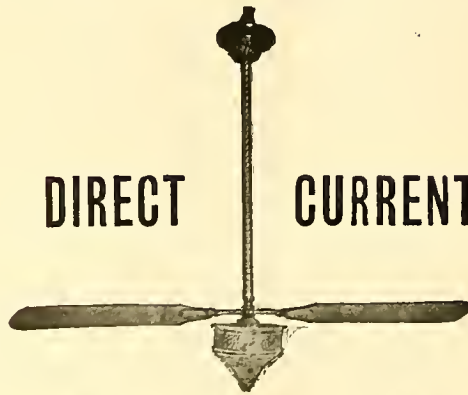
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10 AND 12 NORTH NINTH STREET, ST. LOUIS, MO.

GET OUR PRICES.

The "ELECTRA" Highest Grade Nuernberg Carbons are recognized as standard all the world over.

All genuine "ELECTRA" carbons are put up in packages bearing the label with the trade mark "ELECTRA."



Good carbons mean less cost for current.

All the excellence in dynamos and arc lamps counts for but little where poor carbons are used in lamps.

THE WOOD ELECTRIC MOTO-VEHICLES.

SEND FOR "SPECIALLY FINE" CATALOGUE.

AMONG OTHER THINGS WE GUARANTEE ARE:

- That the material and workmanship in the vehicle shall be of the very best, including rubber tires and ball bearing axles.
- That for a period of one year the Company will replace, free of charge, any broken parts due to defective material or faulty shop construction.
- That the vehicle shall have, on a level hard roadway, a mileage capacity in one charge of the batteries that will carry its given load twenty-five miles at an average speed of twelve and one-half miles per hour, two hours.
- That the batteries can be charged when fully discharged in two and one-half hours' time.
- That the vehicle shall be capable of climbing a six per cent. grade with given load when batteries are reasonably well charged.
- That for the sum of \$50.00 per annum, the Company will furnish all parts for keeping batteries in perfect repairs for a period of five (5) years, leaving them at the end of the five years in good condition for operation during the ensuing year.

AVERAGE COST TO RUN PER MILE, 3-4 CENT.

FISCHER EQUIPMENT CO.,

110-112 EAST TWENTIETH STREET, CHICAGO, ILL., U. S. A.



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COLUMBIA AUTOMOBILES

AT THE

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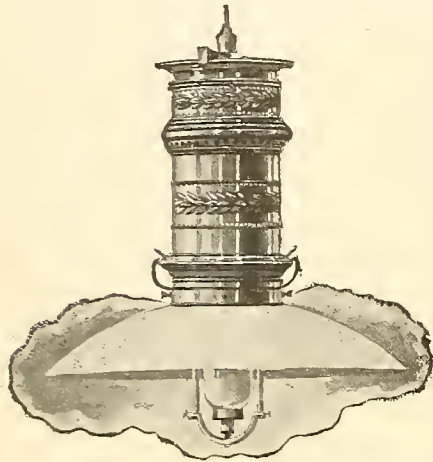
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Both closed and open.
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For Central Station and Street Railway Service.

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For Constant Potential Circuits are Superior in Points of



**SIMPLICITY,
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ELEGANCE,
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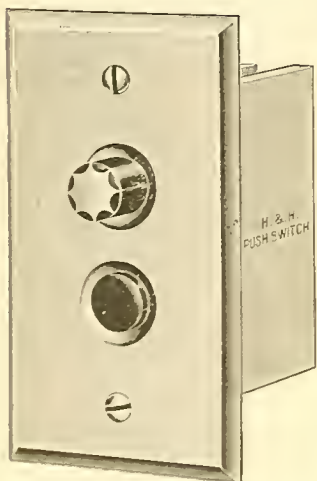
You should see them at the Electrical Exhibition.

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SELLING AGENCIES:

The Manufacturers' & Inventors' Electric Company, 96-98 Fulton Street, New York.
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THE HART H. & H. PUSH SWITCH



IS WITHOUT A PEER.
IT IS EASY TO PUSH.
THE ACTION IS POSITIVE.
THERE IS NO PAINFUL JAR TO THE FINGER WHEN OPERATING.
THE DESIGN, WORKMANSHIP AND MATERIAL ARE THE BEST THAT CAN BE OBTAINED.

MADE IN THE FOLLOWING STYLES, 10-AMPERE CAPACITY ONLY:

- NO. 701 SINGLE POLE.
- NO. 702 DOUBLE POLE.
- NO. 703 THREE-WAY.
- NO. 704 FOUR-WAY.

Also in gangs of any number up to eight.
We make a special line of Iron Wall Boxes and Frames for the installation of these goods.

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THE HART & HEGEMAN MFG. CO., 99 HIGH STREET, HARTFORD, CONN.

CHICAGO: MONADNOCK BLOCK.
NEW YORK: MAIL AND EXPRESS BUILDING.

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Your Electric Light or Street Railway Plant Pay Satisfactory Dividends?

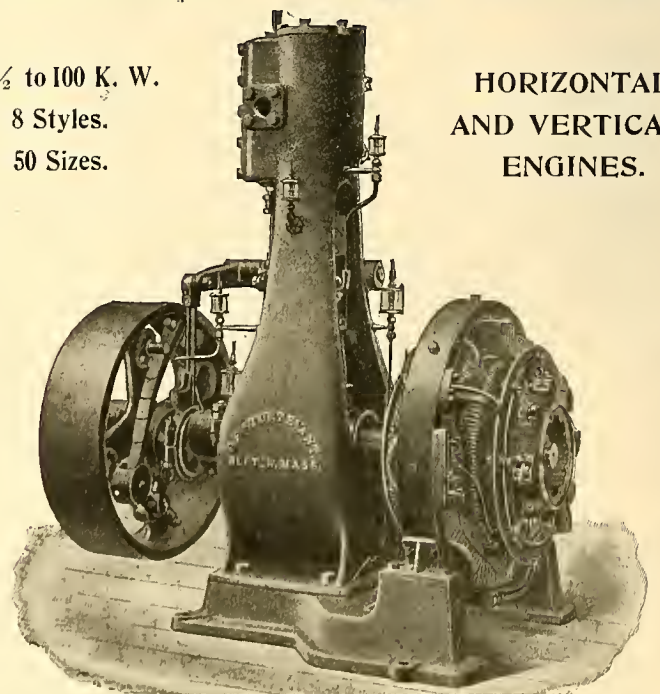
If not, why don't you remodel and put it on a paying basis? That's a specialty of our business.

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Sturtevant Generating Sets.

1½ to 100 K. W.
8 Styles.
50 Sizes.

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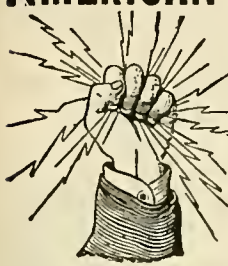
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THE "CLARK" WIRE.

FOR SWITCHBOARD, RAILWAY and MOTOR USE.



All sizes of Stranded and Flexible Wire and Cables with Clark's Insulation

Inspector Boston Fire Underwriters' Union says:
"A thoroughly reliable and desirable wire in every respect."

The Clark wire has been before the public and in use for the past ten years, and has met with universal favor. We guarantee our insulation wherever used, Aerial, Underground or Submarine, and our net prices are as low, if not lower, than any other first-class insulated wire. We shall be pleased to mail Catalogues, with terms and discounts for quantities.

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New and Second-Hand Dynamos and Motors at Lowest Prices.
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I consider the Electrical Engineer Institute conducted by Messrs. Weston and Weston to be of great value to those who desire an Electrical Education
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Write for Catalogue. State subject you wish to study.

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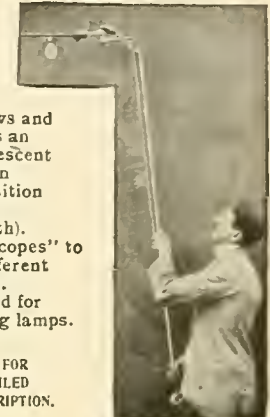
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Consultations, Reports, Estimates, Plans, Specifications, Superintendence, Tests, Purchasing, Designs of Central Stations a Specialty.
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NOVEL AND VERY USEFUL TOOL.



Unsews and handles an Incandescent Lamp in any position (see cut herewith). "Telescopes" to suit different heights. Splendid for cleaning lamps.

SEND FOR DETAILED DESCRIPTION.

THE INCANDESCENT ELECTRIC LIGHT MANIPULATOR Co.,

Room 506,
116 Bedford Street, BOSTON, MASS.
Will be on exhibition at Madison Square Garden, New York, from May 8th to June 10th.

MULTIPOLAR MOTORS AND GENERATORS.

VENTILATED ARMATURES



Which are ventilated inside and outside and have no canvas jackets over the end to prevent circulation of air. Form-wound coils. Armature Core of Charcoal Iron.

RESULT—No Heating, No Sparking and Perfect Regulation.

Ask for Circular 32C. KESTER ELECTRIC CO., Terre Haute, Indiana.

IMPROVED WARREN ALTERNATOR SANDUSKY OHIO



2,000 LIGHTS.

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53 Dearborn Street, CHICAGO.


Manufacturers of the ONLY INTERLOCKING, WHISTLE and ELBOW **SPEAKING TUBE.**

It prevents whistle from falling off. For Sale By Electrical Supply Houses and Hardware Dealers.
Send for descriptive circular.

Letter A—Represents spring in elbow and also represents a covering over the spring, so that plastering will not interfere with same.
Letter C—Represents slot on both sides of whistle.
Letter B—Represents the bottom side up.



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COMPLETE STOCK CARRIED BY
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Our NEW IMPROVED BATTERY keeps the
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IN THE LEAD—PIONEERS ALWAYS

Send for Catalogue of Carriages 1543 Michigan Avenue Chicago, U. S. A.



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Should be filled through the TECHNICAL AGENCY, 1805 Monadnock Block, Chicago. Our list of available men is selected from the best that the country affords. If you need a Draughtsman, Designer, Electrician or Engineering help of any kind, we will send you a number of competent men to select from and without expense to you. As to our reliability, we refer you to the WESTERN ELECTRICIAN.

WANTED.

Expert transformer man wanted, one familiar with the construction and testing of core type transformers. Experience and references, and also state salary expected and how soon would be at liberty to accept a position. Address "TRANSFORMER," care Western Electrician, 510 Marquette Building, Chicago.

POSITION WANTED.

Superintendency or general management of electric plant, by electrical engineer who held similar position in plant three years, and from which company he has excellent recommendations. Address "B," care Western Electrician, 510 Marquette Building Chicago.

WANTED,

By well-known company, manufacturing generators and motors, 2 foremen for the machine shop; one who has had experience in similar work preferred. State experience and salary expected. Address "FOREMAN," care Western Electrician, 510 Marquette Building, Chicago.

WANTED—SITUATION,

By an experienced engineer and electrician, fourteen years' experience in electrical work and steam. I understand the installing and maintenance of electric lighting throughout; have license and good references; plant out of city preferable. Address "H. B.," care of Western Electrician, 510 Marquette Building, Chicago, Ill.

WANTED.

Expert armature winder and repair man. One preferred who, after satisfactory trial, could take few hundred dollars' interest in business. Address, giving particulars and references, ELECTRO-DYNAMIC, care Western Electrician, 510 Marquette Building, Chicago.

WANTED.

100 or 125 h. p. high-speed engine and a 45, 50, 60, or 75 k. w. direct-current 250-volt dynamo. Both must be in first-class condition. Give guaranteed description and spot cash quotation. Emmetsburg Electric Light & Power Co., Emmetsburg, Iowa.

WANTED.

After June 15, position as manager with a progressive independent telephone company. Twelve (12) years (eight with Bell Companies) practical experience as exchange and district manager. Am posted in modern exchange and toll-line construction, switchboards and instruments. Familiar with office work and electrical testing. Good references. Address "F. C. B.," care Western Electrician, 510 Marquette Bldg., Chicago, Ill.

PROPOSAL FOR BIDS FOR ELECTRIC LIGHT PLANT.

The city of Falls City, Nebraska, will receive bids on the following apparatus at their city hall, on June 12, 1899, at 7:30 p. m.

One 75 k. w. alternator, sixty cycle, direct-connected type, speed not more than 300 revolutions.

Also switchboard of marble, with iron frame of suitable size, with following instruments mounted and ready to set up:

- One ammeter.
- One voltmeter.
- One switchboard transformer with fuse block.
- One exciter switch.

Four high tension knife-blade switches, double pole

Eight high-tension single-pole or four high-tension double-pole fuse boxes, exciter and alternator rheostats mounted on rear of board with hand wheels in front.

The various manufacturers of apparatus to bid on their nearest standard size of apparatus.

All apparatus to be delivered F. O. B. at Falls City, Neb., and engineer to superintend erection free of charge. Also to state time of delivery.

Also separate proposals for one high-grade automatic engine of suitable size to direct connect to a 75 k. w. generator, steam pressure 100 pounds, delivered as above.

Bidders must specify their apparatus in detail.

All bids must be directed to the City Clerk of Falls City, Nebraska.

The council reserves the right to reject any and all bids.

WANTED.

ARMATURES TO REWIND.

Winders direct from T-H. and Westinghouse shops Work guaranteed. Ten years' experience. Light plants installed complete. Send for prices.

HODGE-WALSH ELECTRICAL ENGINEERING CO. 701 Delaware St., KANSAS CITY, MO.

WANTED.

The Twin City Electric Company of Grand Rapids, Wis., are in the market for new or good second-hand apparatus for their proposed lighting plant, to consist of the following machinery and apparatus:

One 150 to 200 k. w. two-phase alternator, with exciter and switchboard instruments.

Fifty alternating-current arc lamps, 350 watts each, to be run on a series circuit controlled by a step-up transformer at switchboard.

Necessary transformer and controlling apparatus for arc lamps, 1,500 lights capacity, of new style transformers, 1,000 or 2,000 volts; primary 100 to 200 volts; secondary from 100 to 200 lights each.

Some second-hand weatherproof wire, No. 4 to No. 8.

Line and arc lamp suspension appliances.

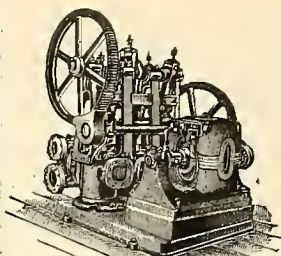
One engine, 200 to 300 h. p. Corliss (or four valve, equal in economy); compound with condenser preferred.

250 h. p. capacity of boilers, capable of carrying 115 lbs. safe working pressure at least.

All necessary pumps, condenser, heaters, valves, piping, smokestack, belts and appliances required with the above. (About 75 wattmeters, 10 to 30 lights each; one steam engine indicator; one portable voltmeter for direct or alternating current.)

We are ready to receive bids on any or all of this material, new or second-hand. All material to be delivered F. O. B. cars at Centralia, Wis., with substantial guarantee as to condition.

Send full description, with size of pulleys, speed, etc. We would be pleased to have your lowest figures on anything you may have to offer.



SMITH-VAILE TRIPLEX PUMPS.

OPERATED BY ELECTRIC MOTOR.

SINGLE AND DOUBLE ACTING.

HOUSE PUMPS, ELEVATOR PUMPS, WATER WORKS PUMPS, ETC.

Pumping Machinery for Every Possible Duty New Catalogue Free.

Manufactured by THE STILWELL-BIERCE & SMITH-VAILE CO., DAYTON, OHIO, U. S. A.

Selling Agents: Risdon Iron Works, San Francisco, Cal.; C. B. Boothe & Co., Los Angeles, Cal.

FOR SALE.

Westinghouse Compound Engine, cylinders 11x19x11 inches, speed 900. This engine is now in regular operation, but will be replaced at once by larger size. It is guaranteed in strictly first-class condition and will be sold with capstone, if desired, and at half cost for cash. THE RED OAK ELECTRIC CO., Red Oak, Iowa.

FOR SALE.

An Electric Light Plant in Indiana town of 8,000, now earning from 15 to 20 per cent. Great bargain for the right man. Good reason for selling. Address "FOSTER," care of WESTERN ELECTRICIAN, 510 Marquette Bldg.

10,000 New Rubber Storage Battery Jars for sale cheap. Old electrical material bought and sold.

WALSH'S SONS & CO., NEWARK, N. J.

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Automatic Motor Starters, Overload Motor Starters, Automatic Pump Starters, Belted Elevator Starters.

Automatic Speed Regulators.

THE CHICAGO RHEOSTAT CO., 1649-50 Marquette Building, Chicago.

BARGAINS IN DYNAMOS, ENGINES.

Write for Price List No. 22.

Direct Current Dynamos, Alternating Current Dynamos, Arc Dynamos, Engines, Boilers, Heaters, Pumps, all sizes. This apparatus has been in use in our own stations, and we therefore know its exact history, and can state that it is in thoroughly good operative condition.

CHICAGO EDISON COMPANY, 139 ADAMS ST., CHICAGO.

CUSTOMERS PAY FOR ADVERTISING AND THEREFORE APPRECIATE BREVITY.

Paiste Attachment Plugs have porcelain base and cap.

Paiste Rosettes have knife-switch contacts.

Jenkins Snap-Switch Contacts are ground to a fit.

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Scrap Copper Wire Wanted.

If you have any Old Copper Wire of any description to dispose of, it will pay you to communicate with us, as we are 2% all times in the market for any quantity of Scrap Copper Wire, at the highest market values. We pay cash and send prompt returns. We are also supplying the electrical trade with our high grade Babbitt, Cotton Waste, Solder, Etc. Please communicate with us.

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EVERYBODY KNOWS STEWART.

Write us for prices on anything in the following list or any other machinery wanted. This list comprises a few of our large stock.

Generators, 500 volt.
 One T.-H. class 10, 40 k. w.
 Two Edison No. 20, 60 k. w.
 Four Edison No. 32, 100 k. w.
 Two T.-H. m-p., 75 k. w.

Dynamos.
 Two 200 light, 16 c. p., 110 volt.
 One 100 light, 16 c. p., 110 volt.
 Two 2,000 c. p. T.-H. L. D. 2, 35 light.
 One 2,000 c. p. Standard, 40 ft.
 One 3,000 c. p. Brush, 1 ft.
 One 10 amper Wood, 3 ft.

Motors, 500 volt.
 One 1/2 h. p. Keystone.
 One 1 h. p. T.-H.
 Two 3/4 h. p. T.-H.
 One 10 h. p. Eddy.
 One 25 h. p. Brush.
 One 50 h. p. T.-H.

Motors, 220 volt.
 One 1/2 h. p. Warwick.
 One 7/8 h. p. Mather.
 One 10 h. p. Daff.
 One 15 h. p. Eddy.
 One 16 h. p. Edison.

The above are second-hand, in good condition.
FOR SALE QUICK. 34 street cars, both open and closed, equipped each with pair No. 6 Edison motors at \$200 per car.

DEALERS IN & REPAIRERS OF ELECTRICAL MACHINERY

TELEPHONE 1420

FOR SALE.

"Hill" Clutch Pulleys.

- One 48-in. diam., 9 in. face, 3 1/8-in. bore
- Four 48 " " 9 " " 3 7/8 " "
- Two 52 " " 14 " " 3 1/8 " "
- Two 52 " " 14 " " 5 1/2 " "
- One 52 " " 16 " " 3 7/8 " "
- One 66 " " 12 " " 3 1/8 " "

Nordberg Clutch Pulleys

One 52-in. diam., 9-in. face, 5 1/2-in. bore. New—has never been on a shaft.

Wood Split Pulleys.

- One 52-in. diam., 8 in. face, 5 1/2-in. bore.
- One 16 " " 8 " " 5 1/2 " "
- One 26 " " 8 1/2 " " 2 1/2 " "
- One 33 " " 7 1/2 " " 2 1/2 " "

One Double Arm Iron Pulley, 48-in diam., 33-in. face, 4 15-16 in. bore.

One Armature Pulley, 26x14x3 1/2 in.

One 50-light Dynamo, good as new.

Shafting for above pulleys, with ball and socket pillow blocks and floor stands. Couplings for 3 7-16 shaft.

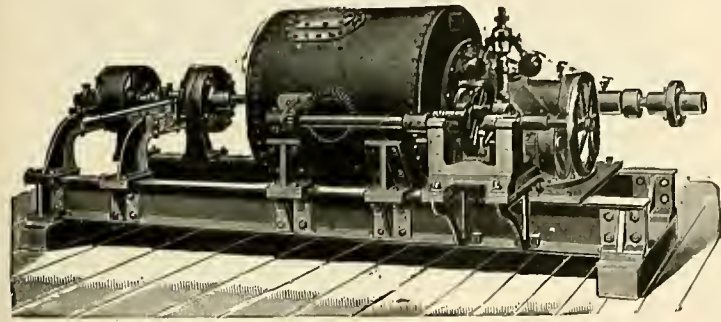
Two 8-in. Steel I-beams, 16 ft.

This is all in good, serviceable condition, and was replaced with heavier machinery.

Write for prices on what you can use.

MENOMINEE Electric Light, Railway & Power COMPANY. MENOMINEE, MICH.

Victor Turbines Operating Dynamos.



That there are more Victor Turbines in use supplying power for electric generators than any other is due to the many points of superiority possessed by this Turbine.

FEATURES WORTH REMEMBERING:

- High Speed,
- Great Capacity,
- Perfect Cylinder Gate,
- Close Regulation,
- High Efficiency,
- Steady Motion.

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Manufacturers and Dealers in
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Oak Pins, Electrical Mouldings, Oak Brackets.
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THE VALENTINE-CLARK CO., 234 La Salle St., Chicago.
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WHOLESALE PRODUCERS,
50-foot to 80-foot Poles our Specialty.

White Cedar Poles
AND STREET RAILWAY TIES.
WHOLESALE PRODUCERS, **PERRIZO & SONS, Daggett, Mich.**

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TORREY CEDAR CO.,
CLINTONVILLE, WIS.
Large Stock Constantly on Hand.

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WE CONTROL THE OUTPUT OF CEDAR ON THE LINE OF THE WISCONSIN & MICHIGAN R.R. 55 MILES IN LENGTH, COVERING A TERRITORY OF OVER 400 SQUARE MILES OF CEDAR FORESTS.

WE HAVE A LARGE STOCK OF ALL SIZES FOR PROMPT SHIPMENT.
NOTE: OUR QUOTATIONS ARE BASED ON ACTUAL STOCK ON HAND.

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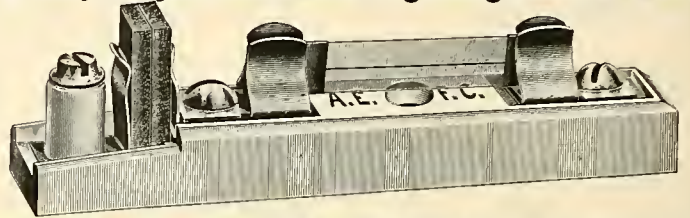
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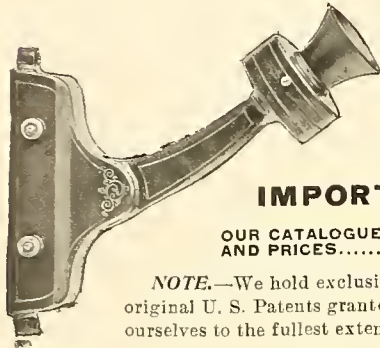
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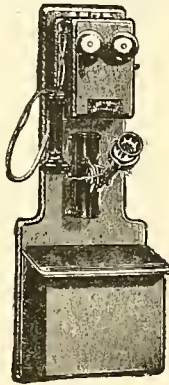
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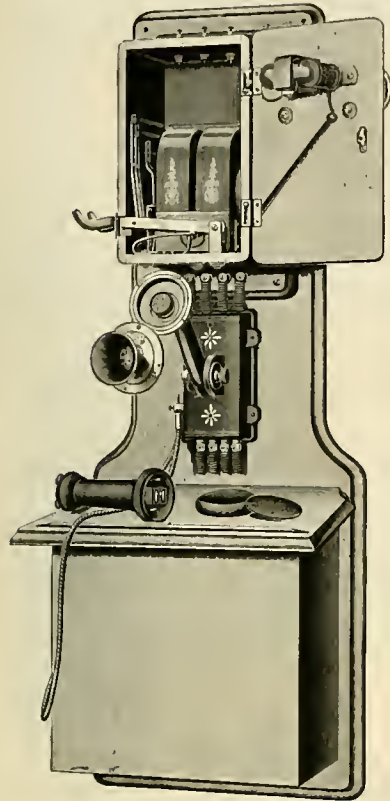
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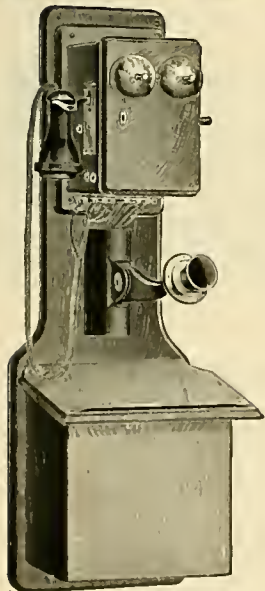
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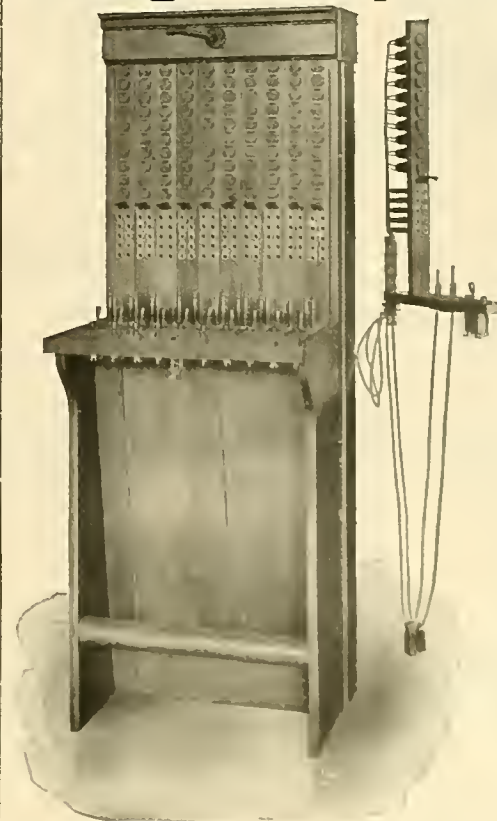
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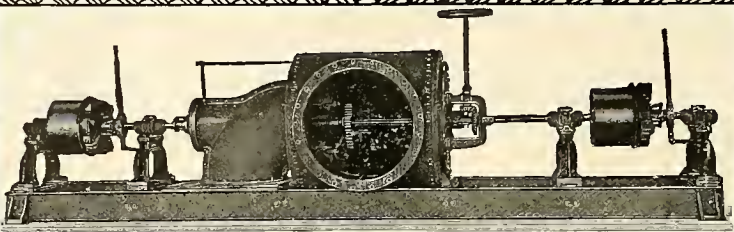
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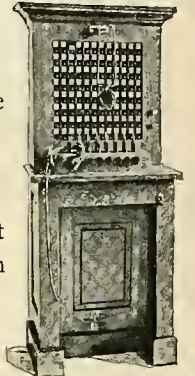
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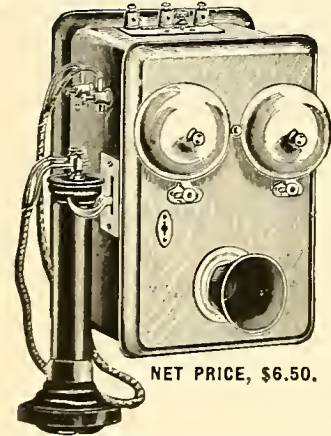
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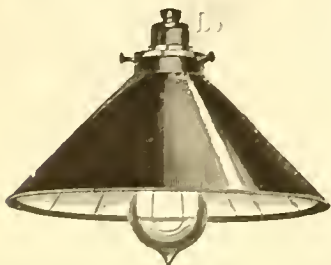


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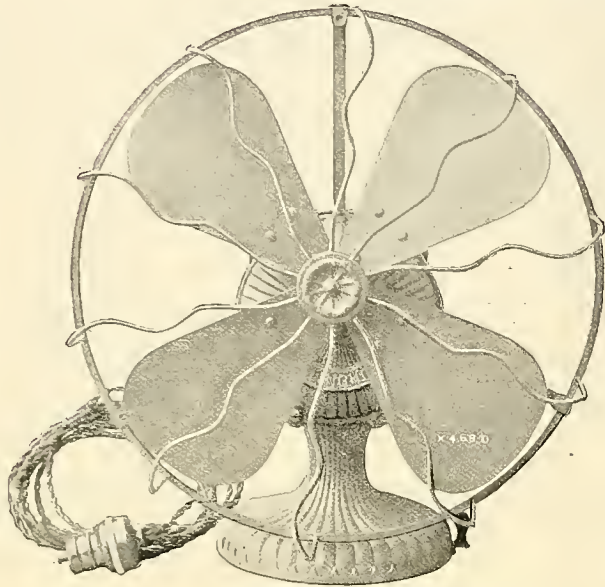
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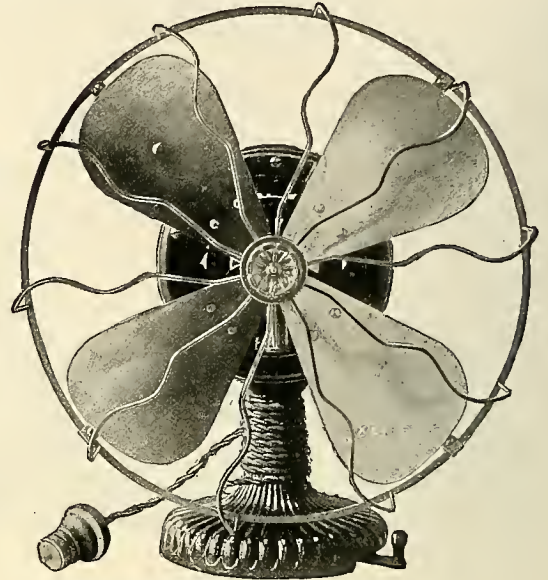


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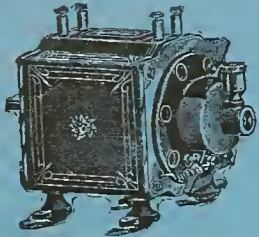
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The land has been deeded this strong financial institution for practically 23 years, and the money paid by the investors is deposited with the Trust Company, which transfers it to the management only upon evidence that the development contract is being faithfully carried out.

A Guarantee Bond of \$100,000

Has now been approved by and deposited with the Chicago Title and Trust Company, and is for the purpose of indemnifying the members, if the association fails in any of its agreements, and possible 7 assures the scientific development of the land—obviously the pivotal point.

First Dividend, 10 per cent., May, 1899.

This will come from a crop of tobacco now nearly matured and very promising. Thereafter steadily increasing dividends will be paid in cash by the Trust Company in May each year, and will be the investor's net cash or they as shown in the table above.

Excursions to the Plantation

Will be conducted by the association every few months, and inspectors selected monthly by the members to visit the land and make an exhaustive report. The first one will be selected within a week. The work of clearing the land and erecting buildings is now going on, and will be supervised by a team of expert tropical horticulturists.

Table with 2 columns: DIVIDENDS.—Over and Above Payments. Rows include Sixth Year (\$450.00), Seventh Year (\$1,075.00), Profit (\$1,525.00), Net Surplus (\$1,090.30), and Eighth to Fiftieth Year Annual Income (\$1,000 to \$1,500).

Some Objections Answered.

We do not go to the capitalist with this proposition, for the excellent reason that the capitalist can do alone what we are doing co-operatively, and some of them are doing it and getting big returns. The originators of this association expect to make a profit of \$100 an acre out of the \$350. The capitalist, by doing the work himself, can save our profit. Do you think that we promise too much? If so, go to the public library and read up on tropical horticulture; go to the document department and get the consular reports.

Some of Our Members.

H. C. Fuller, auditor of the Crane Co. Mr. Titus, local treasurer, Ill. Cent. Ry. W. S. Pluney, chief traveling auditor, Ill. Cent. Ry. G. W. Hsiter, purchasing agent, Ill. Cent. Ry. Arthur Woodcock, lawyer, and formerly manager of the Trust Department, American Trust & Savings Bank. A. B. Sloan, manager fuel oil dept., Standard Oil Co. J. W. Howell, attorney, 1015 153 La Salle St. Rev. M. J. Haynes, pastor, Belden Ave. Baptist Church. Dr. J. H. Prothero, N. W. Dental College, J. Charles Smith, cashier, City Treasurer's office. B. Bailey, assistant superintendent, Grant Terminal Ry. John A. Wleferth, Corn Exchange National Bank. Harry Manning, Deputy U. S. Appraiser, 250 La Salle Avenue. Rev. E. J. Hulnes, assistant pastor Plymouth Congregational Church. Lawrence Hesselroth, druggist, 170 E. Chicago Ave.

Over 1,600 Members—70 per cent. of Shares Sold.

Included in this number are 25 Chicago school principals and about 100 teachers, not to mention many well-known business and professional men, who have thoroughly investigated our proposition.

Your Last Opportunity—All Will be Sold by May 30.

The shares are selling rapidly, and it now seems certain that all will be taken and the books closed by May 30. If you can possibly spare \$12.50 per month, take five acres, which will give you an independent life income. If you can't carry five, take less. Fill out the blank application below and mail it at once. It is the opinion of everybody connected with the association that within a year the shares will bring a premium, which will increase annually for ten years. This insures the ready sale of your shares at a profit, if unable to keep up your payments.

If you want to investigate further, our literature will be sent upon application, or I or one of my assistants will call at your home, if you will make an appointment. Call at the office Saturday and talk it over.

APPLICATION FOR CONTRACT.

Form for Mexican Plantation Association application, including fields for name, address, and signature.

Mail this to E. E. CALKINS, 1603, 100 Washington Street, Chicago, Ill.

Address the special agent, E. E. CALKINS, 1603, 100 Washington Street, Chicago, Ill.

Western Electrician

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Vol. XXIV. CHICAGO, JUNE 10, 1899. No. 23

SIMPLEX INSULATED WIRES AND CABLES.
 RUBBER COVERED, WEATHERPROOF, UNDERGROUND AND SUBMARINE.
 WESTERN SELLING AGENT: **Simplex Electrical Company,**
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Electric Cables, Conduits, Wires and Accessories.
 Also High Grade Rubber Covered Wires and Cables.

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 TRADE MARK
 1889—Paris Exposition, Medal for Rubber Insulation.
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THE STANDARD FOR RUBBER INSULATION.
 Sole Manufacturers of
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H. A. PAQUETTE & CO.,
 53 Dearborn Street, CHICAGO.
SPEAKING TUBE.
 Manufacturers of the ONLY INTERLOCKING WHISTLE and ELBOW
 It prevents whistle from falling off. For Sale By Electrical Supply Houses and Hardware Dealers.
 Send for descriptive circular.
 Letter A—Represents spring in elbow and also represents a covering over the spring, so that plastering will not interfere with same.
 Letter C—Represents slot on both sides of whistle.
 Letter B—Represents the bottom side up.
 Pat. applied for.

The Only Fire Detective Cable in the World.
 Every Fractional Part of which is continuously Thermostatic, and designed for all Interior Electric Wiring Adaptations. It lights the gas! Rings the door bell! It automatically notifies of fire and indicates that burglars are at work, all in one installation.
 Why use dormant wires? The Montauk Automatic Thermostatic Electric Cables are as sensitive to heat or fire as the nervous system of a human being is to the touch of flame.
 Write for descriptive matter. Call and see cables operated.
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 Telephone 4031 Cortlandt. 100 Broadway, NEW YORK.

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 WITH PAINT OR VARNISH ACCORDING TO CHEMICAL LAW INSTEAD OF BY HABIT. NOWHERE ARE EXPERIMENTS OR ARCHAIC METHODS SO WASTEFUL.
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 Acme Testing Sets, Queen-Wirt Switchboard Instruments, X-Ray Focus Tubes, Induction Coils.
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 Bipolar and Multipolar Motors from 1/2 to 50 horse power. Dynamos from 10 lights to 700. We sell or rent. Good profits for agents. The Hobart Elec. Mfg. Co., Troy, Ohio.

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CIRCUIT BREAKERS
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 THE PERFECT TRANSMITTER
 35 PACKING, NO ADJUSTING, NO TROUBLE.
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THE BEST ON EARTH
TIPLESS LAMPS
THE SHELBY ELECTRIC CO.
 SHELBY, OHIO

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Weston Standard Portable Direct Reading Voltmeters, Millivoltmeters, Voltmeters, Ammeters, Milliammeters, Ground Detectors and Circuit Testers, Ohmmeters, Portable Galvanometers.
 Our Portable Instruments are recognized as The Standard the world over. The Semi-Portable Laboratory Standards are still better.
 Our Station Voltmeters and Ammeters are unsurpassed in point of extreme accuracy and lowest consumption of energy.
 Mention the WESTERN ELECTRICIAN when writing for catalogues.

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 MANUFACTURERS OF
ELECTRIC SOLDERING IRONS, TAILORS' IRONS, LAUNDRY IRONS, HAT IRONS, CURLING IRON HEATERS, ETC. Also other Devices for Electrical Heating.
 197 RIVER STREET, DETROIT, MICH.

Tel. 3348 39th St.
CARY SPRING WORKS,
 240 and 242 West 29th St., New York City.
WIRE and SPRINGS

From the Chicago Chronicle, Friday Morning, May 26, 1899.

PLAN AN ELECTRICAL SHOW

Promoters Wish to Hold It at Autumn Festival Time.

Corporation Is Formed to Forward the Proposed Exhibition.

Tattersall's to Be the Scene of the Varied Displays.

Several Big Concerns Have Already Promised to Take Space.

It is now an assured fact that Chicago is to have an electrical exposition on a large scale next fall. The extensive show is to be held under the auspices of the National Exposition of Electrical Arts Company, which has been incorporated in this state with a capital of \$50,000. The officers of the company are: President, N. J. Heinbach; secretary, T. Carrabine; treasurer and manager, W. E. Burnham. It is confidently expected that the exposition, which is to be held at Tattersall's, will prove as great a success as similar ones have in Madison Square garden, New York, during the last two or three seasons.

According to the plans now under consideration the show is to be held from Sept. 25 to Oct. 9, and will be followed by the exhibits to be shown in connection with the annual convention of the American Street Railway association, which is to open Oct. 17 and continue until the 20th of the same month. The autumnal carnival, to be held in connection with the laying of the corner stone of the new postoffice will be in progress on the date set for the opening of the electrical exposition, and the managers of the latter have decided to illuminate the vicinity of Tattersall's with festoons of incandescent lamps in honor of the occasion.

Displays Will Be Practical.

It is the intention of the promoters of the electrical exposition to give a general electrical exhibition, devoting especial attention to household uses of electricity and displaying at the same time the latest advancement of the electrical and allied arts. Ever since the plan of an electrical exhibit was tested and found successful in New York several Chicagoans have been anxious to adopt the scheme in this city. In addition to the household devices it is expected that there will be demonstrations of liquid air, wireless telegraphy, the electrolytic lamp, X-ray phenomena and kindred devices and inventions.

It will be the aim of the promoters of the exposition to conduct these demonstrations in such a manner as to interest and instruct the general public. Thousands of people will be attracted to Chicago during the autumn festival and the promoters of the electrical show count on a large patronage. The illumination of the exposition hall will be made one of the features of the show.

Big Concerns Are Interested.

Among the concerns that have already signified a determination to take part in the exposition are the Chicago Edison Company, Chicago Telephone Company, Postal Telegraph Cable Company, Woods Motovehicle Company and the American Electric Vehicle Company. It is probable that gold medals will be awarded for excellence of exhibits. The exhibition of motor applications of many kinds, heating and cooking by electricity, electric vehicles, new telephone apparatus and improved methods of telegraphy will be made features.

The Chicago Edison company will furnish power in addition to the output of the electric plant in the building. The vicinity of the big building will be illuminated by thousands of incandescent lamps and band concerts will be given daily. Space will be leased to intending exhibitors at rates varying according to space, this work being in charge of W. E. Burnham, who is to manage the exposition. There are 149 exhibit spaces, ranging from 100 to 400 square feet, and in case of extensive exhibits two or more sections may be combined.

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forest,

1,000,000 people will visit Chicago during those dates to witness the big Fall Festivities.

Do you all realize what this will be?

GOLD MEDALS

To be awarded for originality and workmanship.

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Space now in active demand. Send in your application for particulars at once.

From
SEPTEMBER 25
TO
OCTOBER 9, 1899.

AT TATTERSALL'S,
The largest convention hall in Chicago.

DISTINGUISHED GUESTS,
Viz:
President McKinley and Cabinet, Dewey, Bryan, President Diaz of Mexico, and Governor Roosevelt and his "Rough Riders" will be in attendance.

OFFICE, 410 NEW YORK LIFE BUILDING, CHICAGO, ILL.

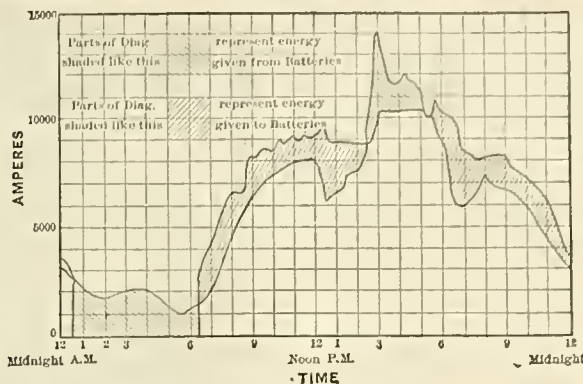
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The Philadelphia Edison Electric
Light Co.

BATTERY CAPACITIES:

15200 ampere-hours at 1520 amperes discharge.
11250 " " 3750 " "
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2.30 P. M. to 5.15 P. M. Battery discharging to assist generators.
5.30 P. M. to Midnight Battery charging.



Manufactured and Installed by
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PHILADELPHIA.

Bulletins describing this and other installations of Chloride Accumulators in lighting and power plants will be furnished upon request.

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Manufacturers of the Wire Cloth Dynamo and Motor Brushes, Solders and Soldering Fluxes of all kinds.
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Alternating-Current Desk and Bracket Fans

THE EMERSON ELECTRIC MFG. CO., ST. LOUIS, MO.



AT LAST!

A Perfect Electric Bicycle Lamp.

12 hours' light costs 5c. No smoke, no oil, no bad smell. Reliable, pretty, guaranteed, strong light, cannot blow out or jar out. Let us tell you more about this and our Electric Carriage Lamp.

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MANUFACTURERS OF

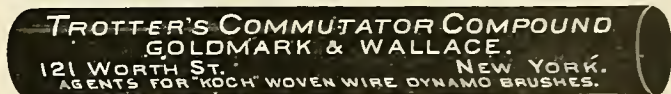
Direct-Current Dynamos and Motors.

Bipolar from 1 kilowatt to 40 kilowatts. Multipolar, 5 kilowatts to 100 kilowatts.

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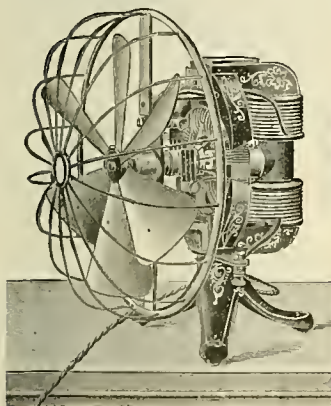
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A perfect lubricator and spark preventer. Prepared only by
TROTTER'S MONA MANUFACTURING CO., Limited,
65 West Broadway, New York City.

EDISON BATTERY OUTFITS



WITH **Edison-Lalande Cells.**

The only efficient battery fan outfits on the market. Invaluable for the sick room.

WRITE FOR CATALOGUE NO. 4.

EDISON MANUFACTURING CO.,

Thomas A. Edison, Proprietor,
135 5TH AVENUE, NEW YORK.

How about your T.-H. lamps?

Don't Study Over this Matter Any Longer.

You will be perfectly safe to speculate on this deal; it is a **sure winner**. Besides being the cheapest clutch on the market it is the simplest and best. Overcomes troubles of the trimmer. Will save you hundreds of dollars in lamp repairs. A trial order will settle this matter. You will be pleased, as others are. We don't ask you to send for 100 or 1,000 just to get your money; get a few to start with, we know we will sell you more.

Agents wanted.

A. W. Knutson & Co.,

Galesburg, Ill.



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HARDTMUTH CORED AND SOLID CARBONS

FOR DIRECT CURRENT ARC LAMPS.

WE HAVE IN STOCK THE FOLLOWING SIZES:

CORED CARBONS.

Diameter. Length.
 5-16 in. x 6 in., 6½ in., 7 in., 7½ in. and 8 in.
 3-8 in. x 7 in., 8 in., 9 in., 9½ in., 10 in. and 12 in.
 7-16 in. x 6 in., 7 in., 8 in., 9 in., 9½ in., 10 in. and 12 in.
 1-2 in. x 6 in., 7 in., 7½ in. and 8 in.
 5-8 in. x 12 in.

SOLID CARBONS.

Diameter. Length.
 7-16 in. x 7 in. and 10 in.
 1-2 in. x 6 in., 7½ in. and 12 in.

Having received a large consignment of these Carbons just before the new tariff went into effect, we are prepared to make very low prices. Send for price list.

CHICAGO EDISON COMPANY,

EDISON BUILDING, 139 ADAMS STREET, CHICAGO.

"HARDY" INCANDESCENT LAMPS.

HARDY LAMP COMPANY, PITTSFIELD, MASS.

TRIUMPH EXHAUST FAN.

JUNIOR WATER BLOW FAN.

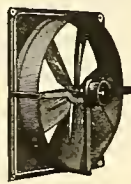
State Water Pressure.

Guaranteed to move

Only Successful

More Air,
Dust, Heat,
Steam, Etc.,
With Less
Power
Than any other
Fan.

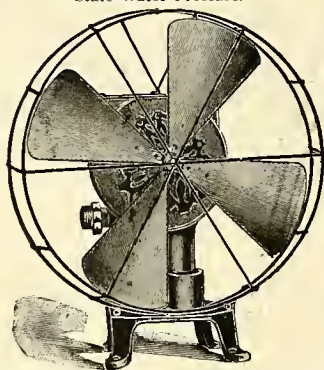
We manufacture
all kinds
of Fans, also
Water Motors.



Water Blow
Fan.

Fans have no
use for them.

Attractive,
Efficient,
Durable,
Most Economical
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Consumption.



Pat. Applied for. Price \$7.50.

Send for Catalog X.

SPECIALTY MFG. CO.,

361 to 367 S. Meridian St.,

INDIANAPOLIS, IND.

KNAPP FAN MOTOR OUTFITS WITH GORDON PRIMARY CELLS

The hot spell of summer is approaching and to those who wish to seek comfort at home or in the office, professional or mercantile, we desire to call attention to these celebrated outfits.

We guarantee the highest speed at the lowest cost for primary cells.

These fan motor outfits are manufactured in two sizes, as follows:

Type C, 8-inch Fan, with 3 No. 1A Gordon Cells.

Type E, 10-inch Fan, with 4 No. 1A Gordon Cells.

These outfits will give a life of over 150 hours without recharging, at a speed of at least 750 revolutions per minute.

For full particulars, price list, etc., address

GORDON BATTERY COMPANY,

594 Broadway, New York.

Western Representative, GEORGE W. PATTERSON, 1539 Marquette Bldg., Chicago, Ill.



Enlarging Facilities.

By reason of very much increased factory facilities we are able to announce many extensions of our lines of Manufacture. Among these is a line of direct-current apparatus for printing-press and elevator work. **DIRECT COUPLED.** Write for full information, giving specifications of your requirements.



WAGNER ELECTRIC MFG. CO.,

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BRANCH OFFICES

BOSTON: 626 Atlantic Ave.

CHICAGO: 1519 Marquette Bldg.

YOKOHAMA, JAPAN: Hagnill & Hillem.

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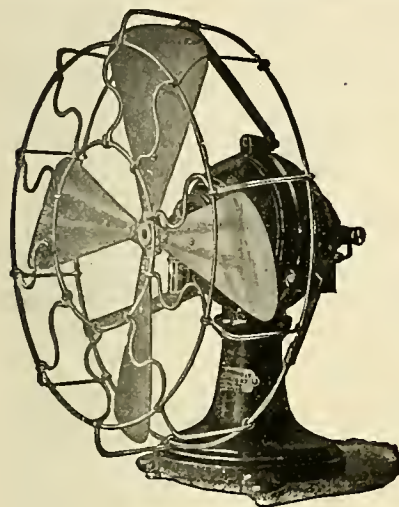
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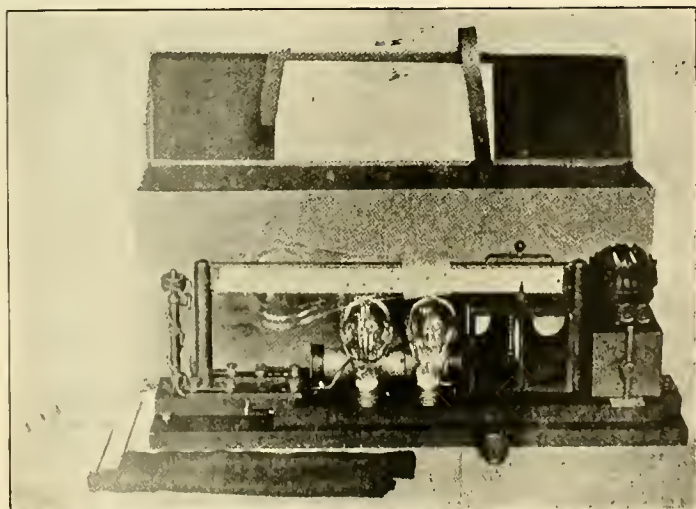
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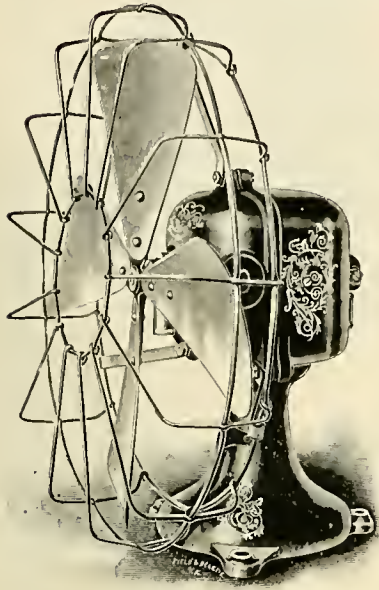
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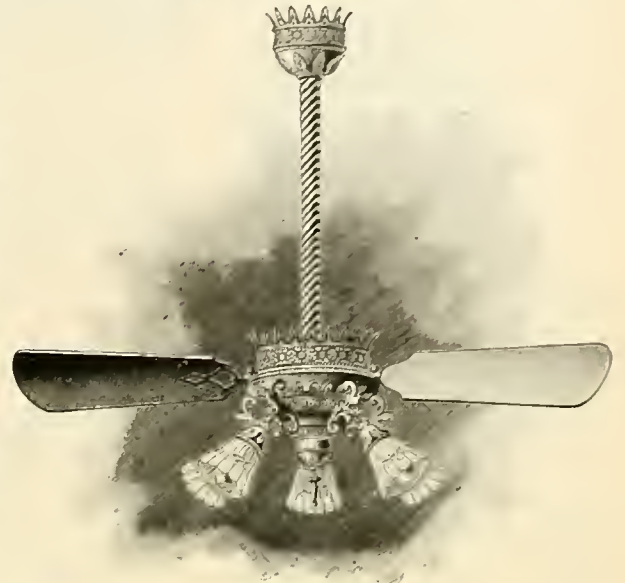
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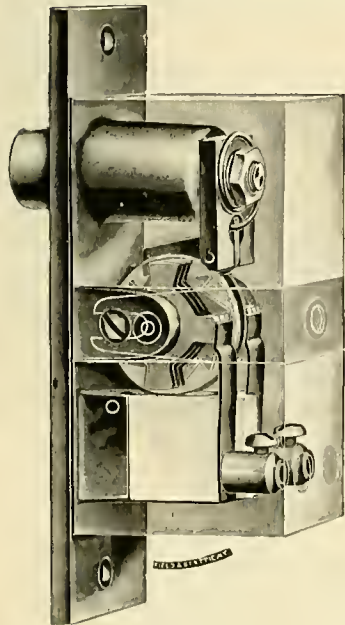
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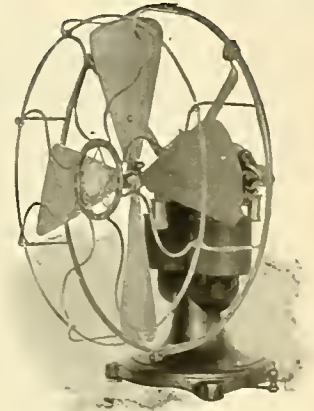
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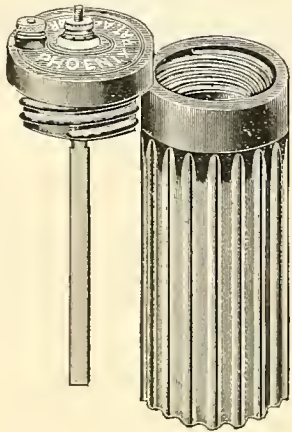
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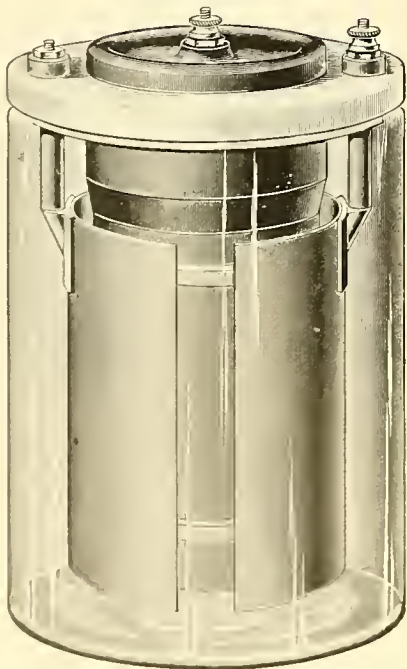
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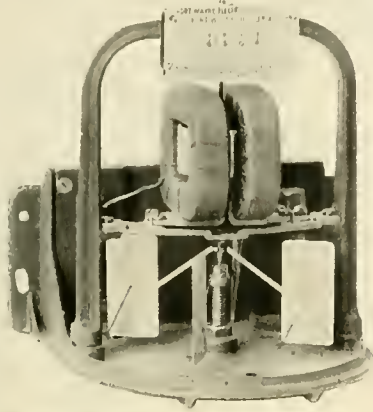
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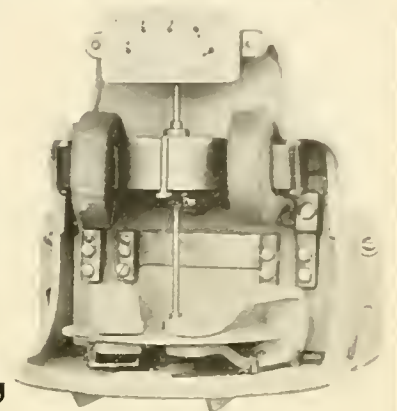
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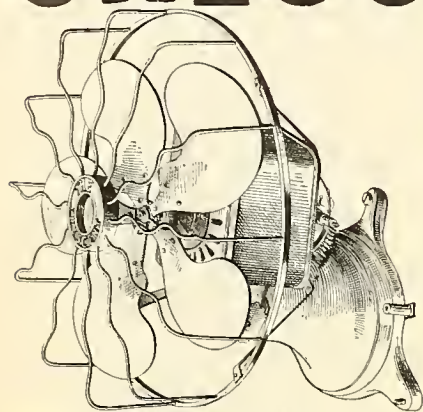
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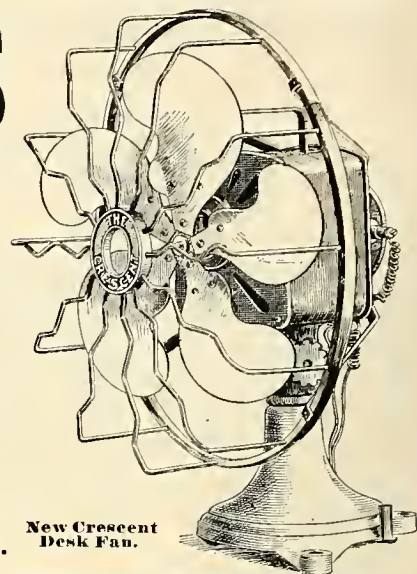
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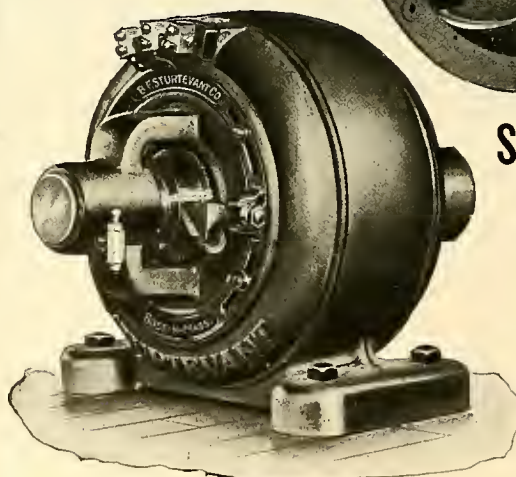
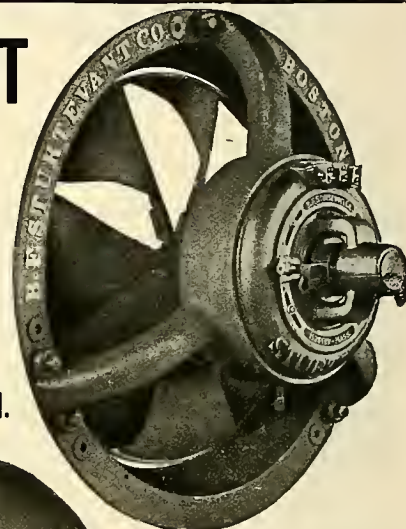
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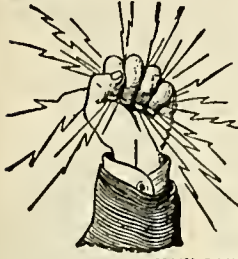
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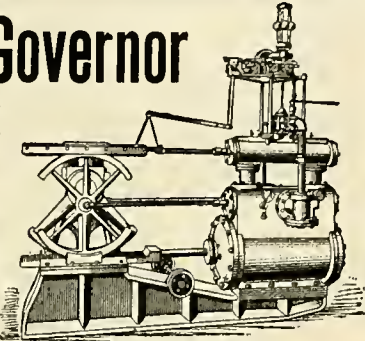
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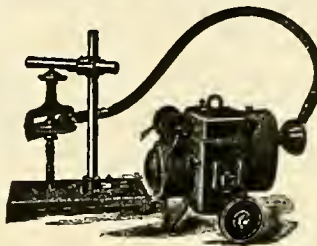
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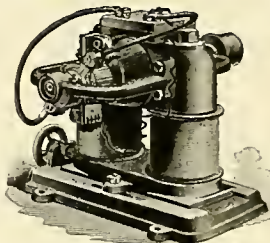
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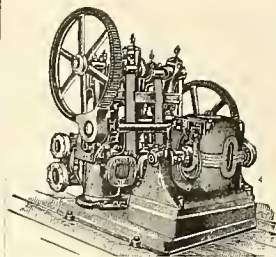
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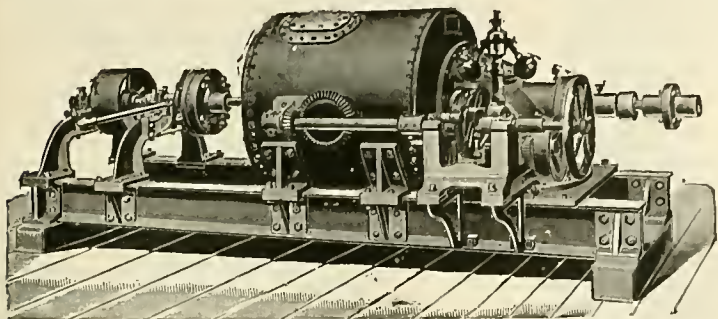
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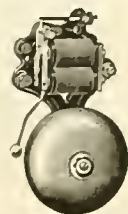
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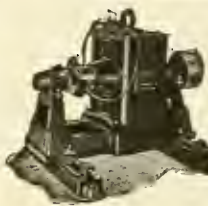
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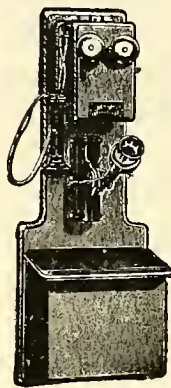
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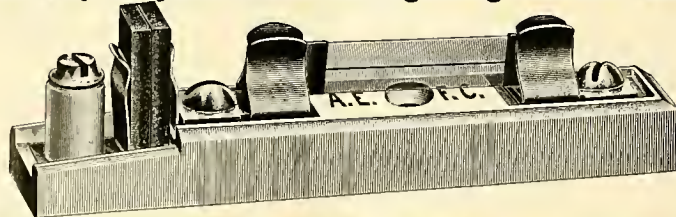
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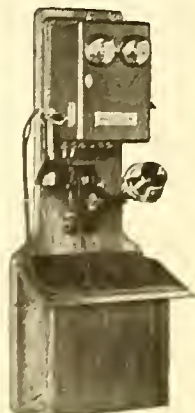
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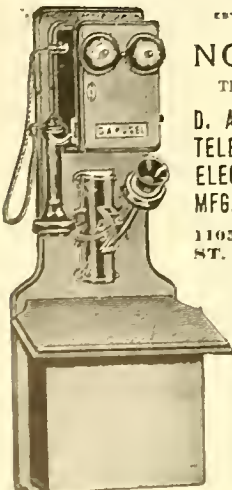
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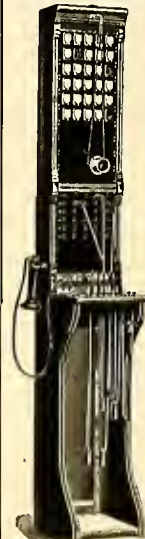
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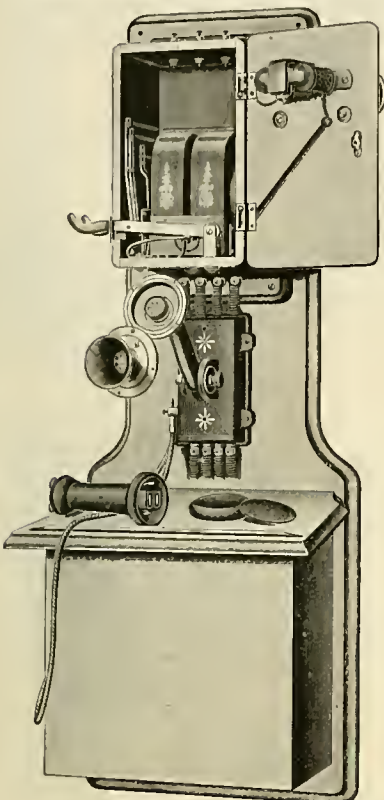
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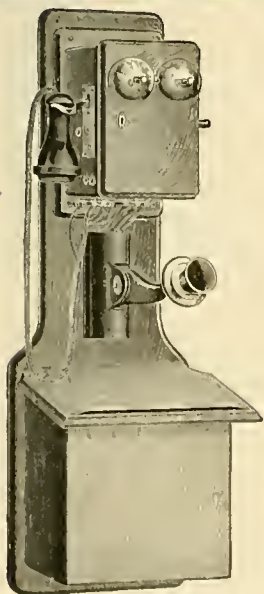
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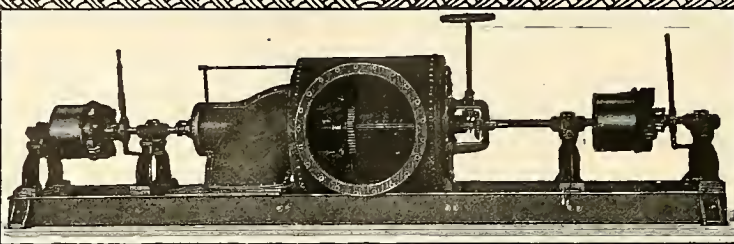
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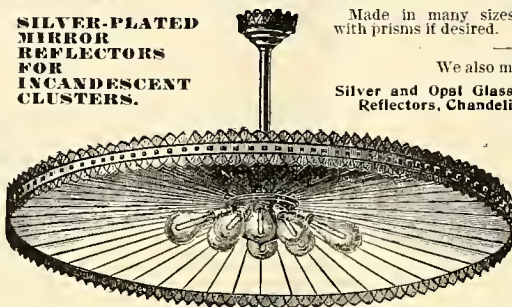
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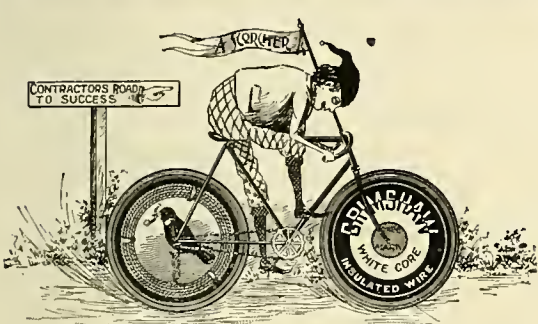


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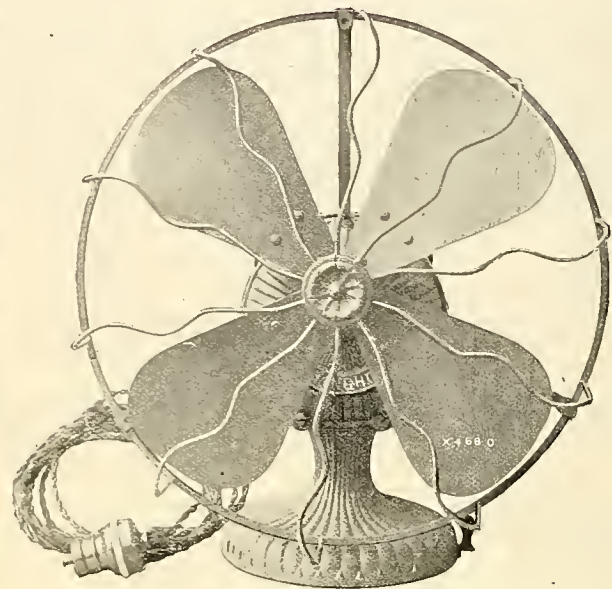
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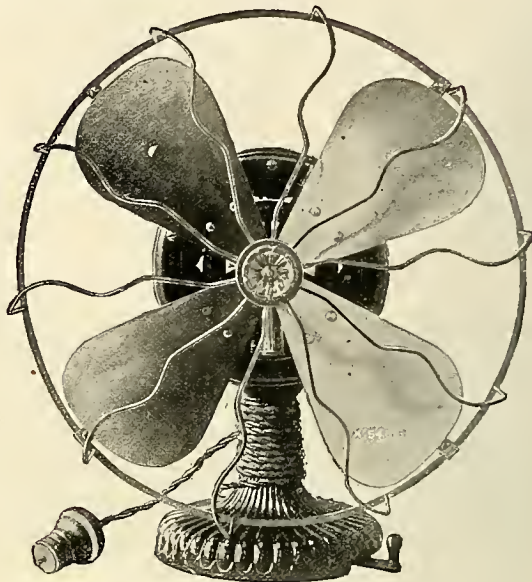


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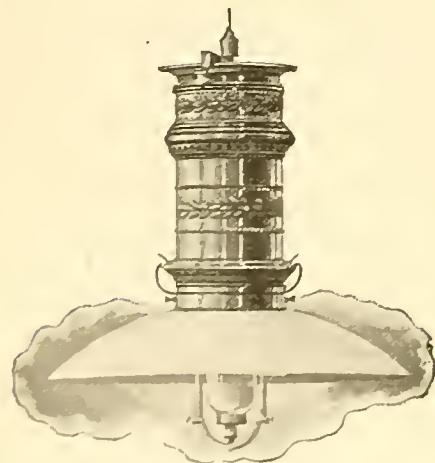
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From the Chicago Chronicle, Friday Morning, May 26, 1899.

PLAN AN ELECTRICAL SHOW

Promoters Wish to Hold It at Autumn Festival Time.

Corporation Is Formed to Forward the Proposed Exhibition.

Tattersall's to Be the Scene of the Varied Displays.

Several Big Concerns Have Already Promised to Take Space.

It is now an assured fact that Chicago is to have an electrical exposition on a large scale next fall. The extensive show is to be held under the auspices of the National Exposition of Electrical Arts Company, which has been incorporated in this state with a capital of \$50,000. The officers of the company are: President, N. J. Heinbach; secretary, T. Carrabine; treasurer and manager, W. E. Burnham. It is confidently expected that the exposition, which is to be held at Tattersall's, will prove as great a success as similar ones have in Madison Square garden, New York, during the last two or three seasons.

According to the plans now under consideration the show is to be held from Sept. 25 to Oct. 9, and will be followed by the exhibits to be shown in connection with the annual convention of the American Street Railway association, which is to open Oct. 17 and continue until the 20th of the same month. The autumnal carnival, to be held in connection with the laying of the corner stone of the new postoffice will be in progress on the date set for the opening of the electrical exposition, and the managers of the latter have decided to illuminate the vicinity of Tattersall's with festoons of incandescent lamps in honor of the occasion.

Displays Will Be Practical.

It is the intention of the promoters of the electrical exposition to give a general electrical exhibition, devoting especial attention to household uses of electricity and displaying at the same time the latest advancement of the electrical and allied arts. Ever since the plan of an electrical exhibit was tested and found successful in New York several Chicagoans have been anxious to adopt the scheme in this city. In addition to the household devices it is expected that there will be demonstrations of liquid air, wireless telegraphy, the electrolytic lamp, X-ray phenomena and kindred devices and inventions.

It will be the aim of the promoters of the exposition to conduct these demonstrations in such a manner as to interest and instruct the general public. Thousands of people will be attracted to Chicago during the autumn festival and the promoters of the electrical show count on a large patronage. The illumination of the exposition hall will be made one of the features of the show.

Big Concerns Are Interested.

Among the concerns that have already signified a determination to take part in the exposition are the Chicago Edison Company, Chicago Telephone Company, Postal Telegraph Cable Company, Woods Motorcycle Company and the American Electric Vehicle Company. It is probable that gold medals will be awarded for excellence of exhibits. The exhibition of motor applications of many kinds, heating and cooking by electricity, electric vehicles, new telephone apparatus and improved methods of telegraphy will be made features.

The Chicago Edison company will furnish power in addition to the output of the electric plant in the building. The vicinity of the big building will be illuminated by thousands of incandescent lamps and hand concerts will be given daily. Space will be leased to intending exhibitors at rates varying according to space, this work being in charge of W. E. Burnham, who is to manage the exposition. There are 140 exhibit spaces, ranging from 100 to 400 square feet, and in case of extensive exhibits two or more sections may be combined.

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1,000,000 people will visit Chicago during those dates to witness the big Fall Festivities.

Do you all realize what this will be?

GOLD MEDALS

To be awarded for originality and workmanship.

The exhibition of motor vehicles on track will be a special feature of the show.

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Space now in active demand.
Send in your application for particulars at once.

From
SEPTEMBER 25
TO
OCTOBER 9, 1899.

AT TATTERSALL'S,
The largest convention hall in Chicago.

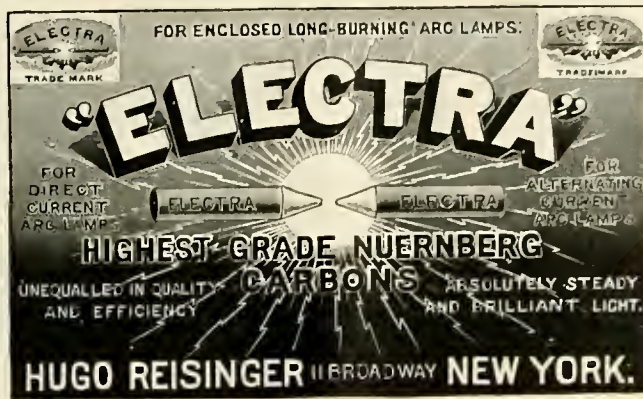
DISTINGUISHED GUESTS,
Viz:

President McKinley and Cabinet, Dewey, Bryan, President Diaz of Mexico, and Governor Roosevelt and his "Rough Riders" will be in attendance.

OFFICE, 410 NEW YORK LIFE BUILDING, CHICAGO, ILL.

The "ELECTRA" Highest Grade Nuernberg Carbons are recognized as standard all the world over.

All genuine "ELECTRA" carbons are put up in packages bearing the label with the trade mark "ELECTRA."

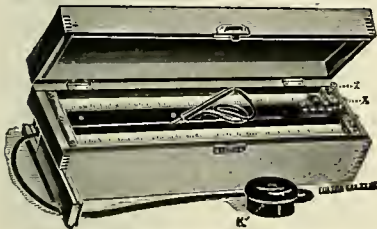


Good carbons mean less cost for current.

All the excellence in dynamos and arc lamps counts for but little where poor carbons are used in lamps.

TROTTER'S COMMUTATOR COMPOUND. GOLDMARK & WALLACE. 121 WORTH ST. NEW YORK. AGENTS FOR KOCH WOVEN WIRE DYNAMO BRUSHES.

All Careful Engineers use MONA COMMUTATOR COMPOUND, A perfect lubricator and spark preventer. Prepared only by TROTTER'S MONA MANUFACTURING CO., Limited, 65 West Broadway, New York City.



The Direct Reading Ohmmeter

WILL ACCURATELY MEASURE RESISTANCE ON A RAPIDLY MOVING ELECTRIC CAR.

No other instrument can meet such difficulties of stray magnetism and vibration. A boy can use it. The brains are in the box.

The American Electric Specialty Co., 123 Liberty St., NEW YORK CITY.

The Fibre-Graphite Commutator Brush.

(U. S. and Foreign Patents.)

No Sparking Under Varying Load. No Wear on Commutator. No Shifting of Quadrant. 80 per cent. Pure Graphite.

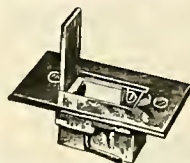
For Sample Order, and Prices, write to

Holmes Fibre-Graphite Mfg. Co., Station Z, Philadelphia.



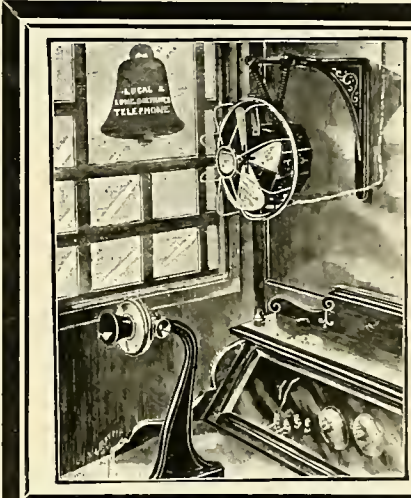
KESTER'S SELF FLUXING SOLDER

Kester Electric Mfg. Co. Manufacturers of the Wire Cloth Dynamo and Motor Brushes. Solders and Soldering Fluxes of all kinds. No. 249-51 So. Jefferson St., CHICAGO, ILL.



THE BEST—THE "NEW STYLE" Receptacle and Attachment Plug.

The latest in this line is the "NEW STYLE" made by WM. T. PRINGLE, 1026 Filbert Street, PHILADELPHIA. Western Representatives: J. B. McKague Co., 324 Dearborn St., Chicago.



THE EDISON TELEPHONE BOOTH FAN MOTOR OUTFIT. INDORSED BY THE LONG DISTANCE TELEPHONE CO.

PERFECTLY NOISELESS.

NO VIBRATION.

KEEP COOL WHEN YOU USE YOUR TELEPHONE.

FULL DESCRIPTION IN BOOKLET NO. 4 EDISON MANUFACTURING COMPANY, THOMAS A. EDISON, PROPRIETOR, 135 FIFTH AVENUE, NEW YORK.

CHICAGO INSULATED WIRE CO. 152-154 Lake St. CHICAGO, ILL. U.S.A.

ALPHABETICAL INDEX OF ADVERTISEMENTS.

Table listing various electrical companies and their page numbers, including Amson Electric Co., Chicago Insulated Wire Co., Kester Electric Mfg. Co., and others.

For Classified Index of Advertisements See Page VI.

We have the Largest and Most Complete Electrical

REPAIR SHOPS

In the West. ELECTRICAL REPAIRS AND MACHINE WORK OF EVERY DESCRIPTION. In having your repair work done by a company operating hundreds of dynamos and motors you are sure of good work and get the benefit of our experience.

CHICAGO EDISON COMPANY,
76 MARKET STREET, CHICAGO.

"HARDY" INCANDESCENT LAMPS.

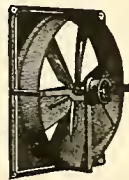
HARDY LAMP COMPANY, PITTSFIELD, MASS.

TRIUMPH EXHAUST FAN.

Guaranteed to move

More Air,
Dust, Heat,
Steam, Etc.,
With Less
Power
Than any other
Fan.

We manufacture all kinds of Fans, also Water Motors.



Send for Catalog X.

SPECIALTY MFG. Co.,

361 to 367 S. Meridian St.,

INDIANAPOLIS, IND.

JUNIOR WATER BLOW FAN.

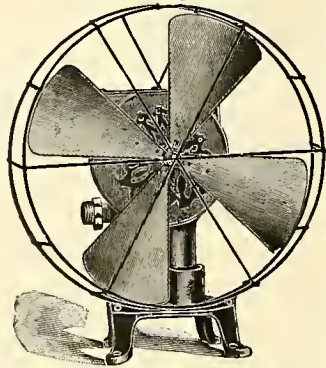
State Water Pressure.

Only Successful

Water Blow
Fan.

Fits have no
use for them.

Attractive,
Efficient,
Durable,
Most Economical
Water
Consumption.



Pat. Applied for. Price \$7.50.

KNAPP FAN MOTOR OUTFITS WITH GORDON PRIMARY CELLS

The hot spell of summer is approaching and to those who wish to seek comfort at home or in the office, professional or mercantile, we desire to call attention to these celebrated outfits

We guarantee the highest speed at the lowest cost for primary cells.

These fan motor outfits are manufactured in two sizes, as follows:

Type C, 8-inch Fan, with 3 No. 1A Gordon Cells.

Type E, 10-inch Fan, with 4 No. 1A Gordon Cells.

These outfits will give a life of over 150 hours without recharging, at a speed of at least 750 revolutions per minute.

For full particulars, price list, etc., address

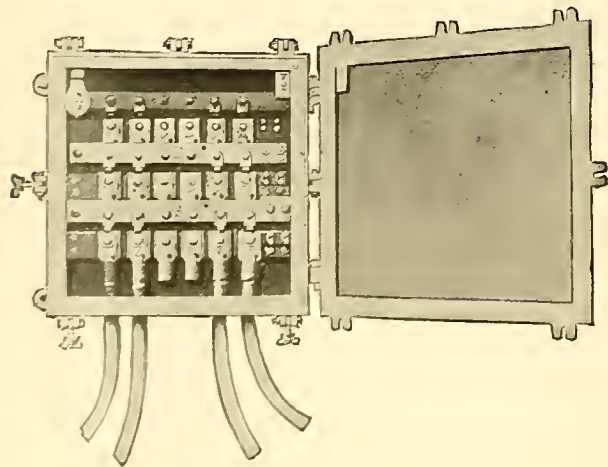
GORDON BATTERY COMPANY,

594 Broadway, New York.

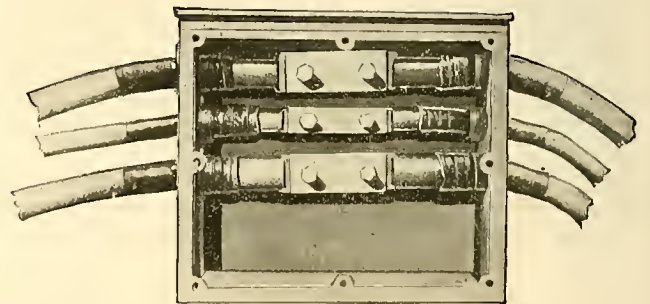
Western Representative, GEORGE W. PATTERSON, 1539 Marquette Bldg., Chicago, Ill.



G. I. UNDERGROUND MATERIAL.



Tailleir Service Boxes.
Tailleir Coupling Boxes.



Tailleir High-Tension Coupling Joints.
Tailleir Junction Boxes.

PARAGON FANS AND WRIGHT METERS.

General Incandescent Arc Light Co.,

572-578 First Ave., Cor. 33d St., NEW YORK.

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BOSTON,
31 Milk Street.

PHILADELPHIA,
233 Drexel Building.

CLEVELAND,
39-47 E. Prospect Street.

SAN FRANCISCO,
598 Parrott Bldg.

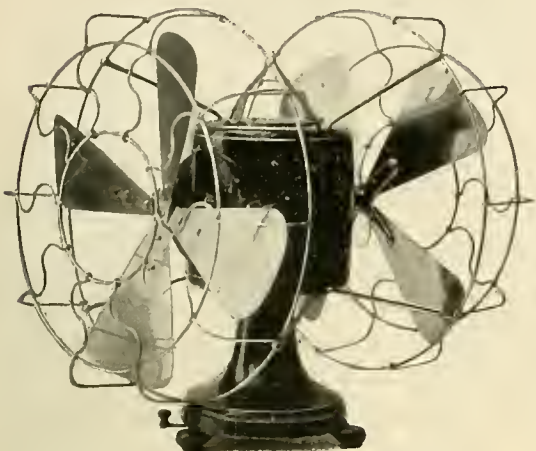
CHICAGO,
1012-13 Monadnock Block.

MARTIN J. INSULL CO.:
ST. LOUIS,
511 Security Building.

MINNEAPOLIS,
616 Guaranty Building.

MILWAUKEE,
700 Pabst Building.

Auto=Auto=Auto.



There Are Automobiles, Automomists and Autocrats.
Our Autographs are never framed and we are partial to seeing those of our customers.

Science is a good thing, but we don't care to further it by furnishing the subject for an Autopsy, when prevention is sold by the watt or on a flat rate.

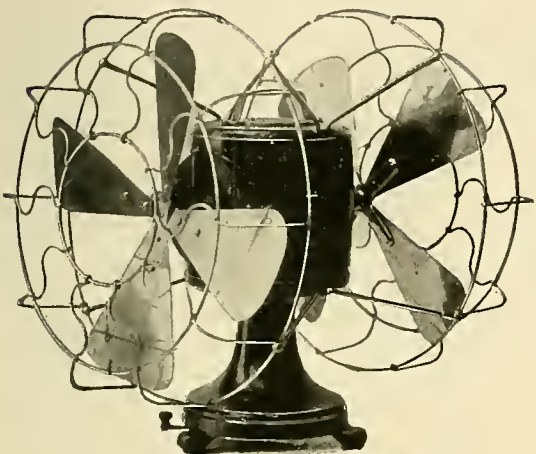
Have You Been Stricken

BY THE

Automatic Weather Bureau Reports?

Just like an Automaton in repeating Southerly Winds, Light Showers, Sultry Indications, Hot Waves, Scorchers and Broilers?

Personally do you seek relief, commercially have you not current for sale, and if a dealer, isn't an article most salable during the proper season?



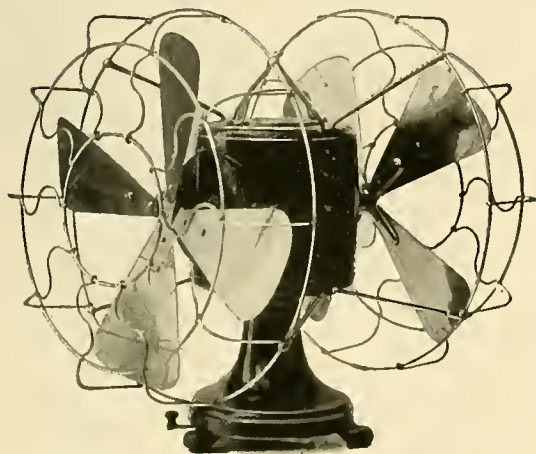
Central Duplex Fan Motors

are in three speeds and AUTOMATICALLY deliver balmy two-directioned consolation, or a spicy suggestion of seaside breezes, or a wild, exhilarating swirl of rejuvenated atmosphere.

Made only in 12-inch Fan, but in amply strong proportion of field and armature to render duplex duty.

The price is not AUTOCRATIC, but simply is half again as much as the single desk type, hence in results the cost is divided and the output doubled.

Our Catalogue of 1899 Fan Motors is free to the trade and our quotations are as prompt as our shipments.



Central Electric Company,

264-266-268-270 FIFTH AVENUE, CHICAGO.



THE DAYS OF TIGHT BELTS ARE OVER.

See Our Exhibit at the Electrical Exhibition,
Madison Square Garden, New York.

A Slack Belt with CLING-SURFACE On It, and a Tight Belt Without It.

CLING-SURFACE MFG. CO., 177-182 VIRGINIA ST., BUFFALO, N. Y.

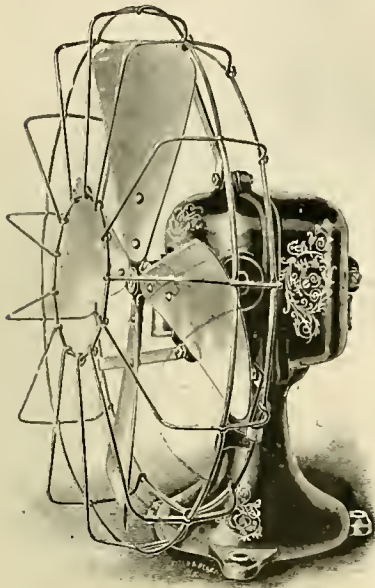
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Monteuk Multiph. Cable Co.
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Simplex Electrical Co.
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Western Elec. Supply Co.
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- Telephones, Telephone Material and Switchboards.**
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American Elec. Fuse Co.
American El. Telephone Co.
Bunnell & Co., J. H.
Central Tel. & Elec. Co.
Ericsson Telephone Co.
Eureka Electric Co.
Holyoke & Holyoke.
Kokomo Tel. & El. Mfg. Co.
Kusel, D. A. Tel. & El. Mfg. Co.
Manhattan Elec. Snp. Co.
Mo. River Tel. Supply Co.
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Central Electric Co.
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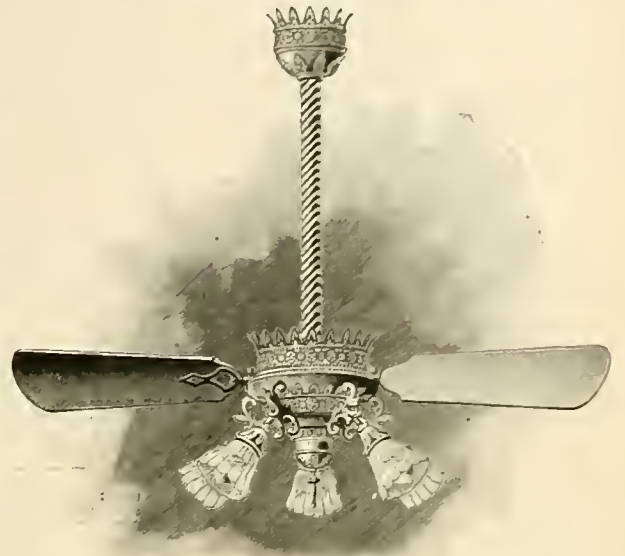
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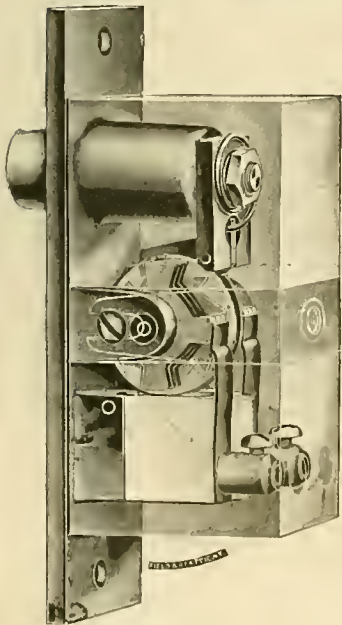
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NO LIGHT!
Open It to Go In—
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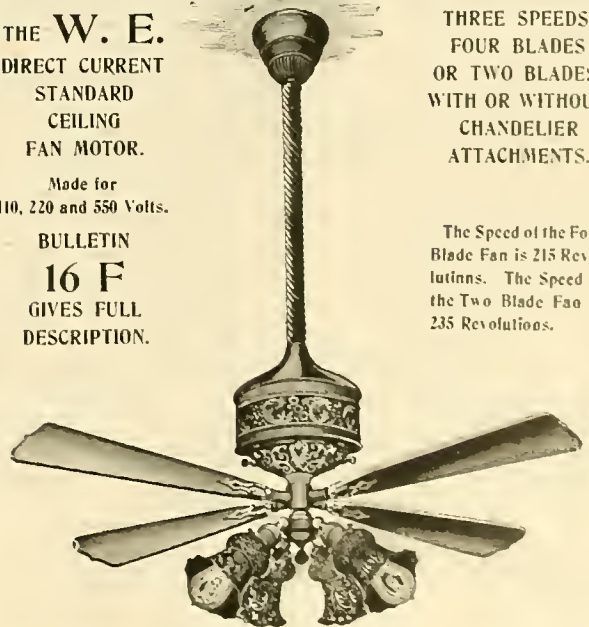
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Made for
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GIVES FULL
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THREE SPEEDS,
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WITH OR WITHOUT
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The Speed of the Four
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**Electric AND Combination
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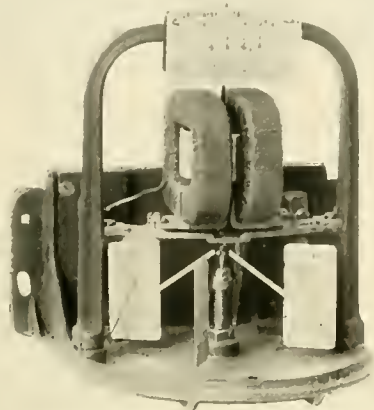
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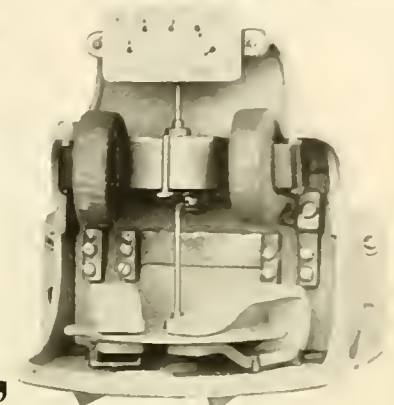


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Have been made in our factory without interruption for five years, and we are still making them. For extreme simplicity the lamp or ampere-hour meter has no equal and it does its work well. The adjustable friction compensator is a device peculiar to our watt-hour meters—they start on one-half of one per cent. of full load. If you do not know all about the **Standard Fort Wayne Duncan Meters** and just where and how they are made, drop us a postal for our new pamphlet. Don't forget the name.



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**2,500 OF THESE FANS
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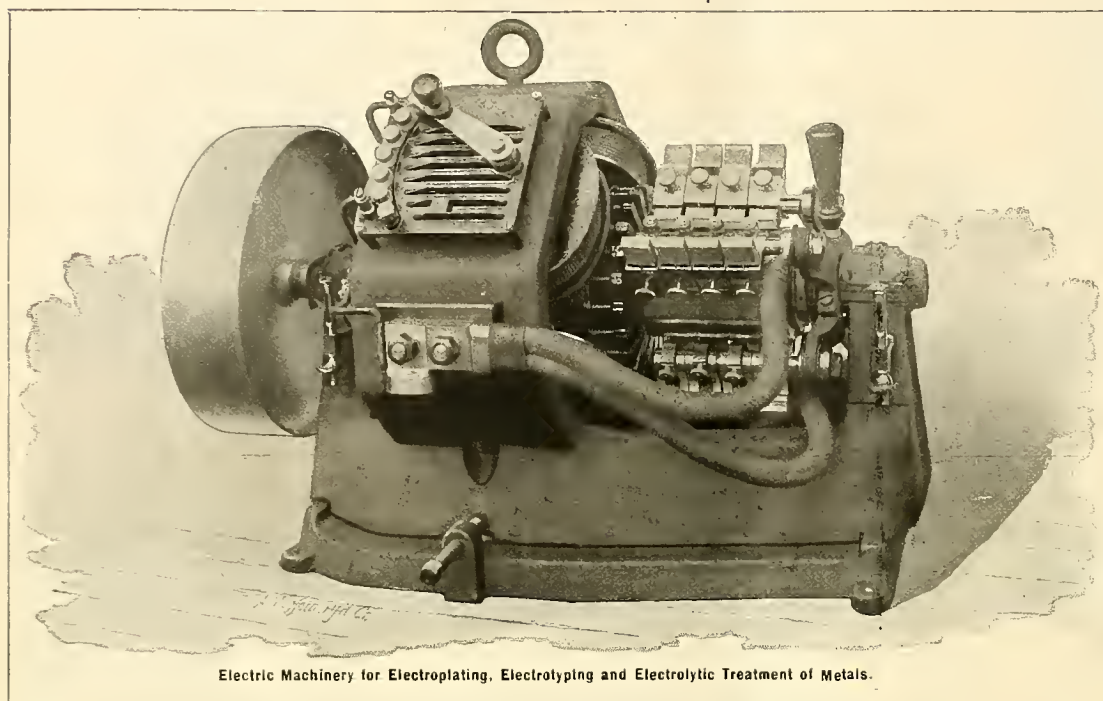
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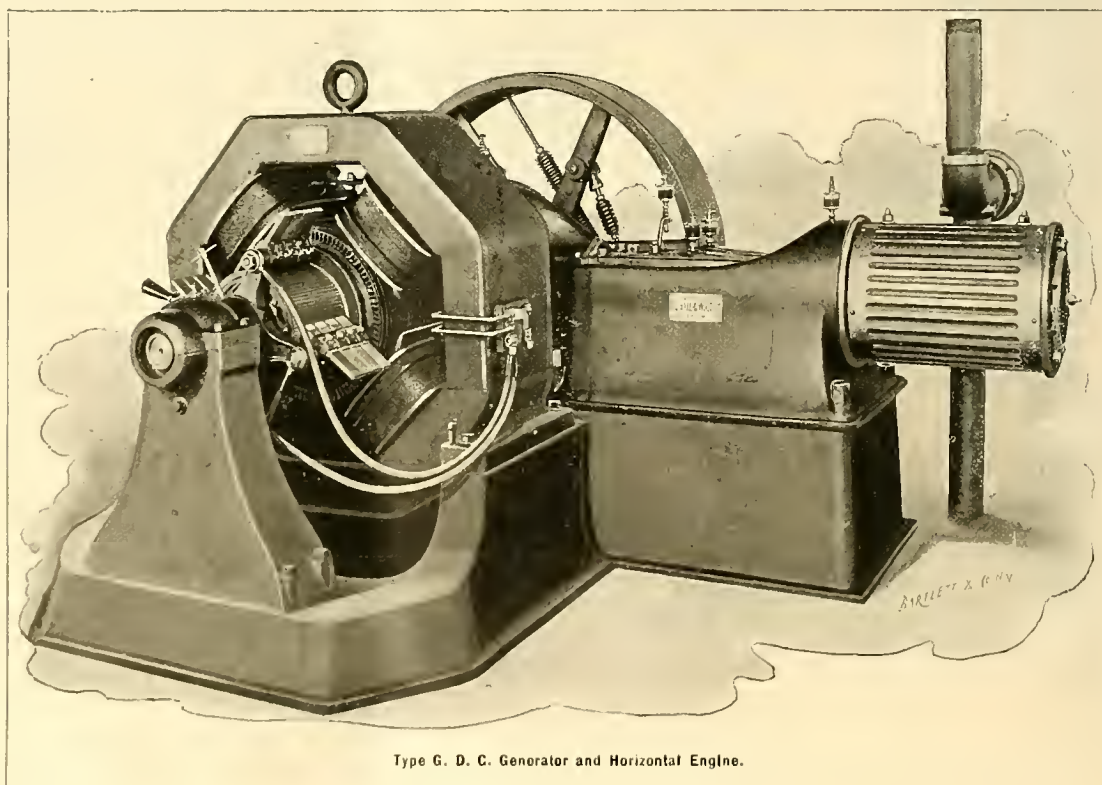
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Medium or Slow Speed.

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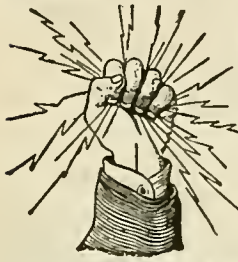
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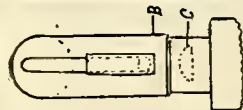
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One 52-in. diam., 9-in. face, 5 1/2-in. bore. New—has never been on a shaft.

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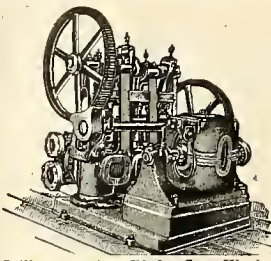
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Direct Current Dynamos, Alternating Current Dynamos, Arc Dynamos, Engines, Boilers, Heaters, Pumps, all sizes. This apparatus has been in use in our own stations, and we therefore know its exact history, and can state that it is in thoroughly good operative condition.

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EVERYBODY KNOWS STEWART.

Write us for prices on anything in the following list or any other machinery wanted. This list comprises a few of our large stock.

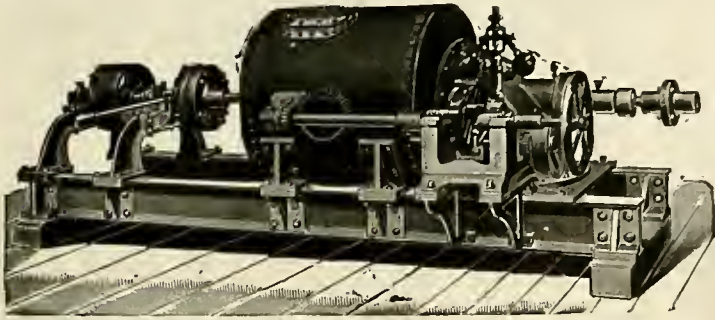
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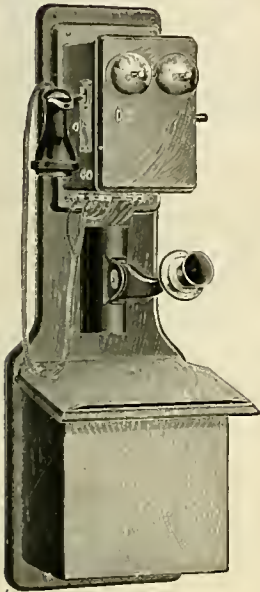
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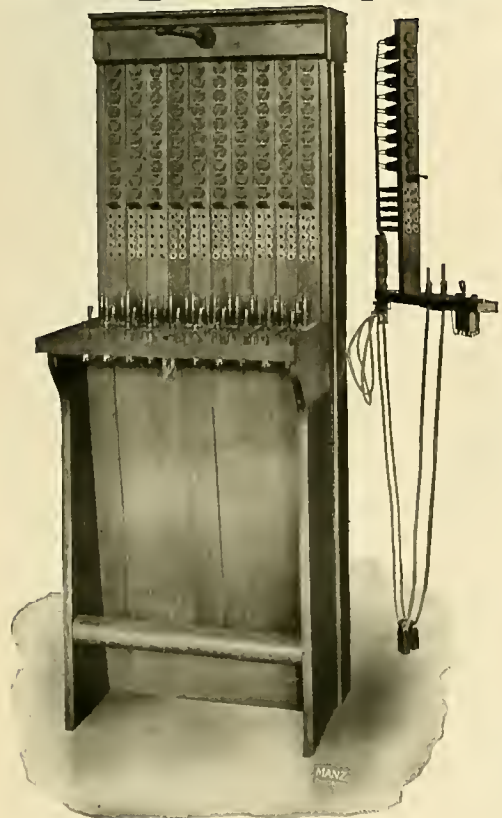
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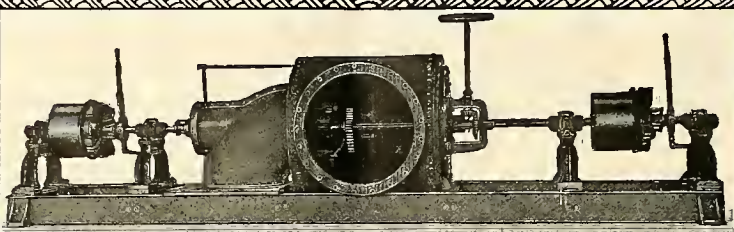
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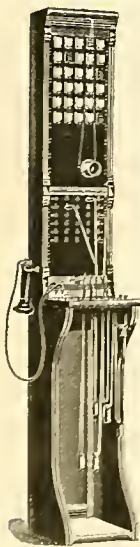
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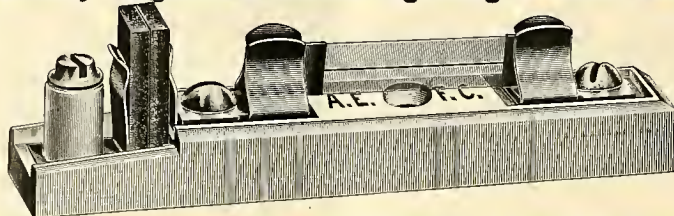
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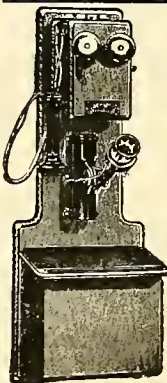
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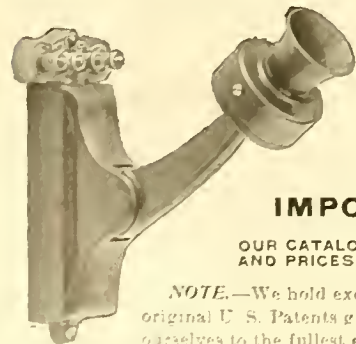
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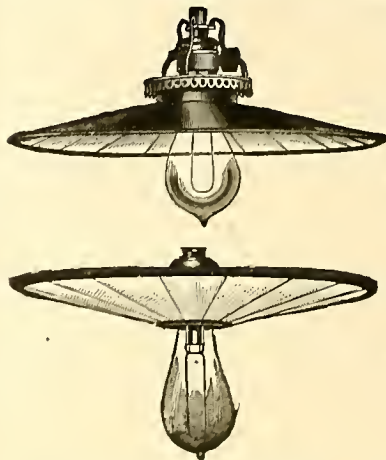
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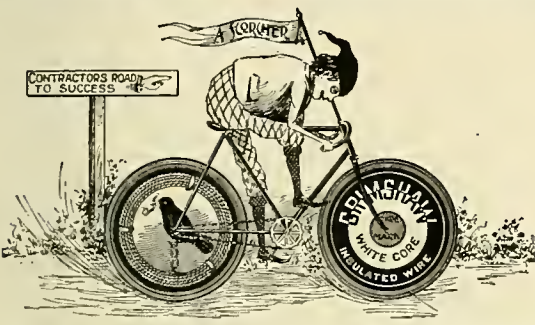
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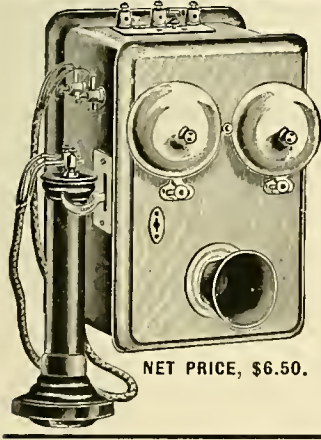
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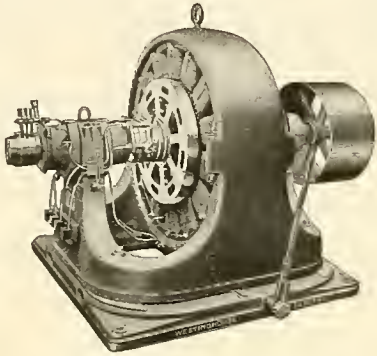
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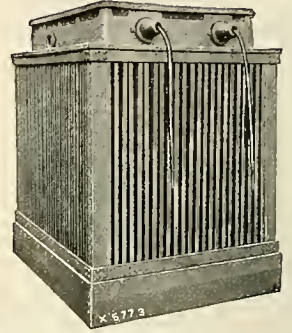
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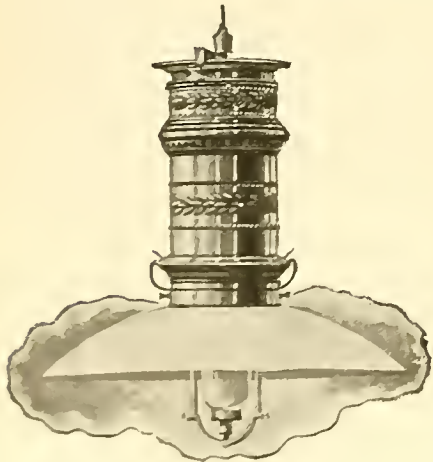
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- NO. 703 THREE-WAY.
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Mechanical Draft

What It Is and What It Does.

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Is essential to success with any boiler plant.

Better Draft

Can be produced by a fan at less first cost and running expense than by a chimney.

Best Draft

Is, therefore, Mechanical Draft, by which these results can be secured.

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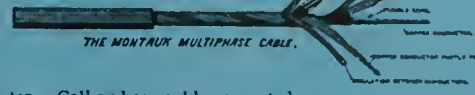
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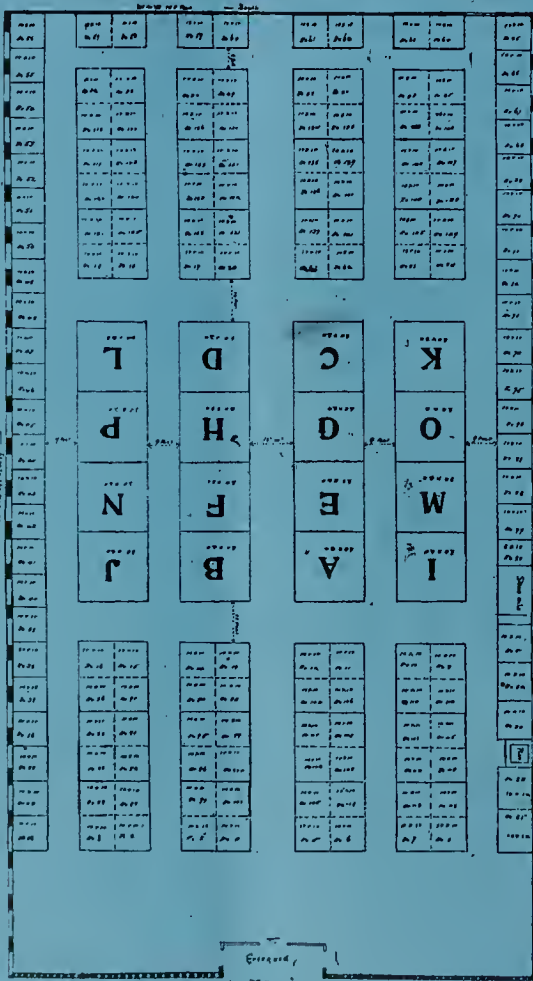
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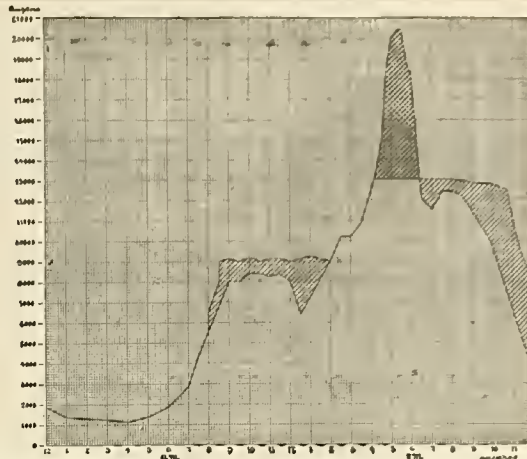
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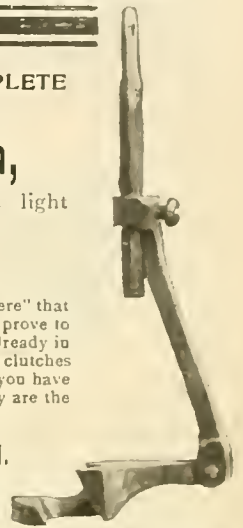
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THE CLUTCH.

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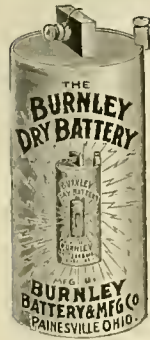
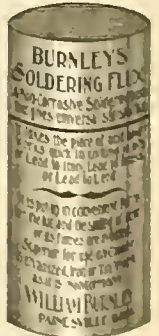
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This is the Pioneer Dry Battery, 1888-1899. Perfected by long experience to absolute reliability. Regular size 6x2 1/2 inches. Special sizes 4x2, 4x1 1/2 and 2x1 1/2 inches. Regular size, 1.5 volts and 6 to 8 amperes. Endorsed by the leading telephone companies and supply houses. Testimonials and endorsements furnished on application to

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Every construction man should use this Paste. Last year we sold 200,000 1/2-pound boxes. It contains no acids, is non-corrosive and insulating in its nature. We put it up in 1/2, 1, 5 and 10 pound packages. The patent claims covering this paste are broad and we will prosecute to the full extent of the law all infringers of our rights.



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GIVES THEM TO YOU AT A SMALL COST.

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TRIUMPH EXHAUST FAN.

Guaranteed to move

More Air,
Dust, Heat,
Steam, Etc.,
With Less
Power
Than any other
Fan.

We manufacture
all kinds
of Fans, also
Water Motors.



Only Successful

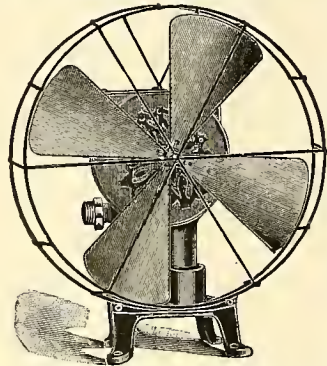
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Fan.

Flies have no
use for them.

Attractive,
Efficient,
Durable,
Most Economical
Water
Consumption.

JUNIOR WATER BLOW FAN.

State Water Pressure.



Pat. Applied for. Price \$7.50.

Send for Catalog X.

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The hot spell of summer is approaching and to those who wish to seek comfort at home or in the office, professional or mercantile, we desire to call attention to these celebrated outfits.

We guarantee the highest speed at the lowest cost for primary cells.

These fan motor outfits are manufactured in two sizes, as follows:

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These outfits will give a life of over 150 hours without recharging, at a speed of at least 750 revolutions per minute.

For full particulars, price list, etc., address

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Western Representative, GEORGE W. PATTERSON, 1539 Marquette Bldg., Chicago, Ill.



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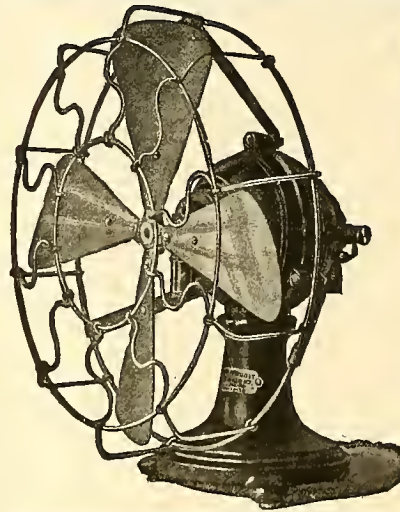
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Satisfactory Dividends?

If not, why don't you remodel
and put it on a paying basis?
That's a specialty of our business.

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ALWAYS the BEST.

A Full Stock.

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INCANDESCENT LAMPS

**WE WILL RENEW OR BUY
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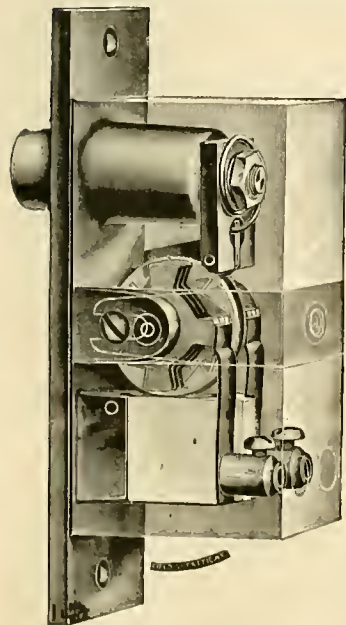


Telephone X-Arms in Chicago stock, as well as all types of Telephone Material, whether for construction or maintenance of a Telephone Exchange.

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THE ECO DOOR SWITCH

Makes Contact Every Other Time.



Approved by
National Board
of Fire
Underwriters.

- When the Door is Shut—
NO LIGHT!
- Open It to Go In—
LIGHT!
- Shut It After You Are In—
STILL LIGHT!
- Open It To Go Out—
NO LIGHT!
- Shut It After You Are Out—
STILL NO LIGHT!

Size over all, 3 3/4 inches long, 1 inch wide, 1 5/8 inches deep.

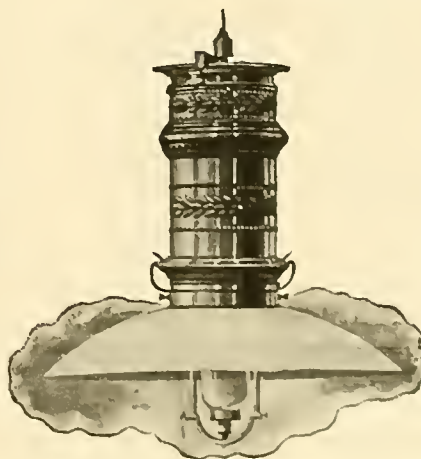
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THE MORRIS ENCLOSED ARC LAMPS

For Constant Potential Circuits
are Superior in Points of



SIMPLICITY, ECONOMY, ELEGANCE, LIGHT.

You should see them
at the Electrical Ex-
hibition.

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A BELT FULL OF CLING-SURFACE

Will neither slip, run off, nor need taking up, and its transmitting capacity is only limited by the strength of the belt.

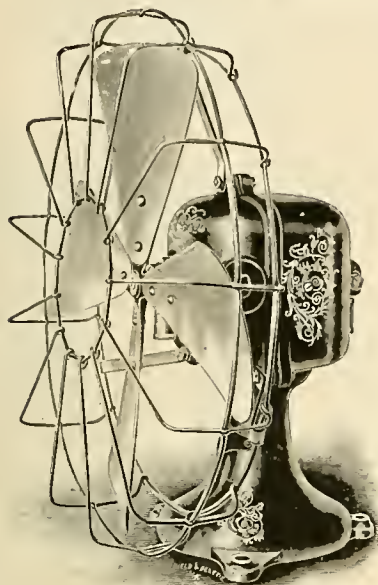
CLING-SURFACE MFG. CO., 177-182 Virginia St., Buffalo, N. Y.

CLASSIFIED INDEX OF ADVERTISEMENTS.

- Annunciators.**
 - Central Electric Co.
 - Edwards & Co.
 - Electric Appliance Co.
 - Illinois Electric Co.
 - Western Electric Co.
 - Western Elec. Supply Co.
- Ars Lamps.**
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 - Diehl Mfg. Co.
 - Ft. Wayne Elec. Wks., Inc.
 - Gates & Randolph.
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 - Morris Arc Lamp Co.
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 - Advance Specialty Co.
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- Gears.**
 - Bealy & Co., Chas. H.
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 - Central Electric Co.
 - Phoenix Glass Co.
 - Western Elect. Supply Co.
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 - Chicago Edison Co.
 - Chicago Insulated Wire Co.
 - Delaware Hard Fibre Co.
 - Electric Appliance Co.
 - Emerson El. Mfg. Co.
 - General Inc. Arc Light Co.
 - Illinois Electric Co.
 - Kartavert Mfg. Co.
 - Mess. Chemical Co.
 - Mica Insulator Co.
 - Munsell & Co., Eugene.
 - National India Rubber Co.
 - New York Insulated Wire Co.
 - Okonite Co., The.
 - Palmer Co., H. T.
 - Peru Elec. Mfg. Co.
 - Phillips Insulated Wire Co.
 - Simplex Electrical Co.
 - Standard Paint Co.
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 - Scherling, Wash. Co.
 - Vulcanized Fibre Co.
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 - Central Electric Co.
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 - Montauk Multiph. Cable Co.
 - National India Rubber Co.
 - New York Insulated Wire Co.
 - Okonite Co., The.
 - Phillips Insulated Wire Co.
 - Roehling's Sons Co., J. A.
 - Safety Ins. Wire & Cable Co.
 - Simplex Electrical Co.
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 - Western Elect. Supply Co.
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 - General Electric Co.
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 - Hardy Lamp Co.
 - Illinois Electric Co.
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 - Shelby Electric Co.
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 - Western Elect. Supply Co.
 - Westinghouse El. & Mfg. Co.
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 - Paquette & Co., B. A.
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 - Mica Insulator Co.
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 - General Electric Co.
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 - General Inc. Arc Light Co.
 - Hobart Elec. Mfg. Co.
 - Illinois Electric Co.
 - Kester Electric Co.
 - Mathews, W. N.
 - Sturtevant Co., B. F.
 - United Elec. Imp. Co.
 - Victor Electric Co.
 - Wagner Elec. Mfg. Co.
 - Warren Elec. Mfg. Co.
 - Western Electric Co.
 - Western Elect. Supply Co.
 - Westinghouse El. & Mfg. Co.
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 - Hecker Name Plate Co.
- Packing.**
 - Bealy & Co., Chas. H.
 - Peerless Rubber Mfg. Co.
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 - Cling-Surface Mfg. Co.
 - Mess. Chemical Co.
 - Standard Paint Co.
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 - Bealy & Co., Chas. H.
 - Phosphor Bronze Sm. Co. Ltd.
- Platinum.**
 - Haker & Co.
 - Goldsmith Bros.
- Poles.**
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 - Brown, M. R., & Co.
 - Central Mfg. Co.
 - Lindsay Bros. Co.
 - Perrizo & Sons.
 - Valentine-Clark Co., The.
 - Worcester & Co., C. H.
- Porcelain.**
 - Central Electric Co.
 - Peru Elec. Mfg. Co.
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 - Swarts Metal Refining Co.
- Reflectors.**
 - Amer. Reflector & Ltg. Co.
- Re-Winding—Repairs.**
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 - Chicago Edison Co.
 - Hodge-Walsh Elec. Eng. Co.
 - Stewart Electrical Co.
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 - General Electric Co.
 - Gen'l Ind. Arc Lt. Co.
 - Iron Chd Resistance Co.
 - Victor Electric Co.
 - Westinghouse El. & Mfg. Co.
- Second-Hand Machinery.**
 - Aaron Electric Co.
 - Chesley Machinery Co.
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 - Mathews, W. N.
 - Rossiter, ManGovern & Co.
 - Stewart Electrical Co.
 - Vandevert, A. J.
 - Walsh's Sons & Co.
- Shades.**
 - Amer. Reflector & Ltg. Co.
- Speaking Tubes.**
 - Central Electric Co.
 - Edwards & Co.
 - Electric Appliance Co.
- Terris.**
 - Klein & Son, Mathias.
 - Chicago Tool Works.
- Transformers.**
 - Central Electric Co.
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 - General Electric Co.
 - Kuhlman Electric Co.
 - Matthews, W. N.
 - Wagner Elec. Mfg. Co.
 - Western Electric Co.
 - Western Elect. Supply Co.
 - Westinghouse El. & Mfg. Co.
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 - Samsom Cordage Wks.
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 - General Electric Co.
 - Westinghouse El. & Mfg. Co.
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 - Leffel & Co., Jas.
 - Paton Water Wheel Co.
 - Stillwell-Bieroe Smith-Valle
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 - Worcester Polytechnic Inst.
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- Wire, Bare.**
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 - Leschen-Macomber-Whyte Co.
 - Okonite Co., The.
 - Paton Insulated Wire Co.
 - Roebbing's Sons Co., J. A.
 - Standard Underground C. Co.
 - Western Electric Co.
 - Western Elect. Supply Co.
- Woodwork, Electrical.**
 - Noblett, E. J.
- X-Ray Outputs.**
 - Central Electric Co.
 - Edwards & Co.
 - Victor Electric Co.

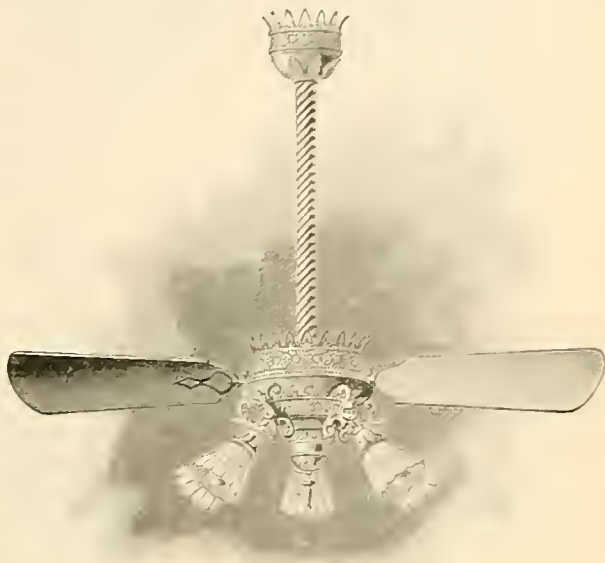
DIEHL ELECTRIC FANS,

FOR ALL CIRCUITS, EXCEPT ALTERNATING.



Our line of Electric Fans for ALL purposes for the present season is the most complete that we have ever placed in the market, and the high standard of our product has been strictly upheld.

Our fans are the cheapest because they are absolutely the best made: wear longest, require less outlay for repairs and show a higher efficiency than any other fan. This statement is fully sustained by the past record of our fans. Our place has always been in the lead and we intend to maintain that position.



SEND FOR CATALOGUE.

DIEHL MANUFACTURING CO.

SHOW ROOMS { 561-563 Broadway, NEW YORK.
192-194 Van Buren St., CHICAGO.
128-132 Essex St., BOSTON.

MAIN OFFICE AND WORKS:

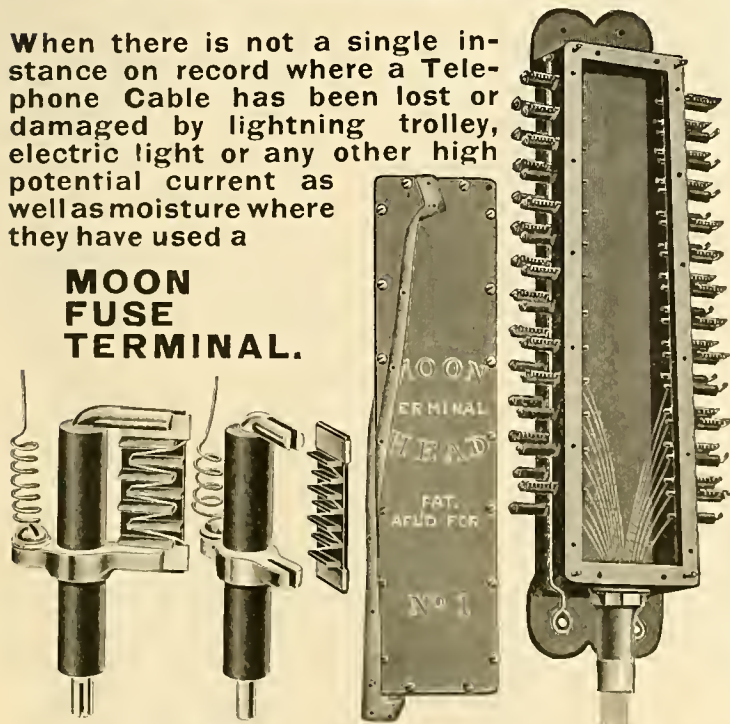
ELIZABETHPORT, N. J.

COLD FACTS.

DO THEY NOT INTEREST YOU?

When there is not a single instance on record where a Telephone Cable has been lost or damaged by lightning trolley, electric light or any other high potential current as well as moisture where they have used a

MOON FUSE TERMINAL.



THE MOON MFG. CO.,

43 to 49 S. CANAL STREET,

CHICAGO.

SEND FOR FAN MOTOR CATALOGUE.

TUERK ALTERNATING CURRENT CEILING FAN.

Note the Results.

Made for

155 Revolutions Per Minute.

52 to 220 Volts.

Spread of Blades, 60 inches.

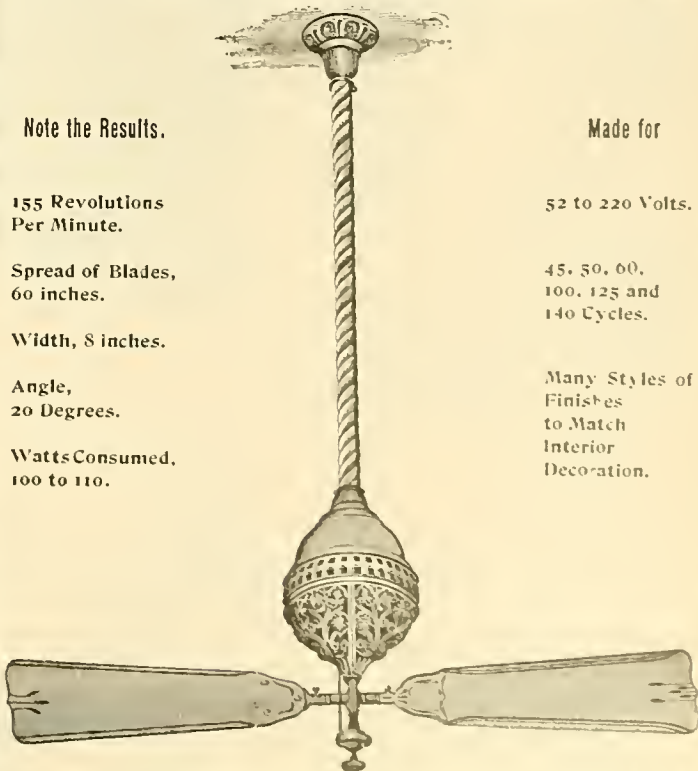
45, 50, 60, 100, 125 and 140 Cycles.

Width, 8 inches.

Angle, 20 Degrees.

Many Styles of Finishes to Match Interior Decoration.

Watts Consumed, 100 to 110.



WESTERN ELECTRIC COMPANY

CHICAGO, NEW YORK.

MANUFACTURERS AND DEALERS,

Electric Light and Power Apparatus, Arc and Incandescent Lamps, Wire, Cable, Telegraph Station and Measuring Instruments, Electric Light and General Supplies.

LONDON.

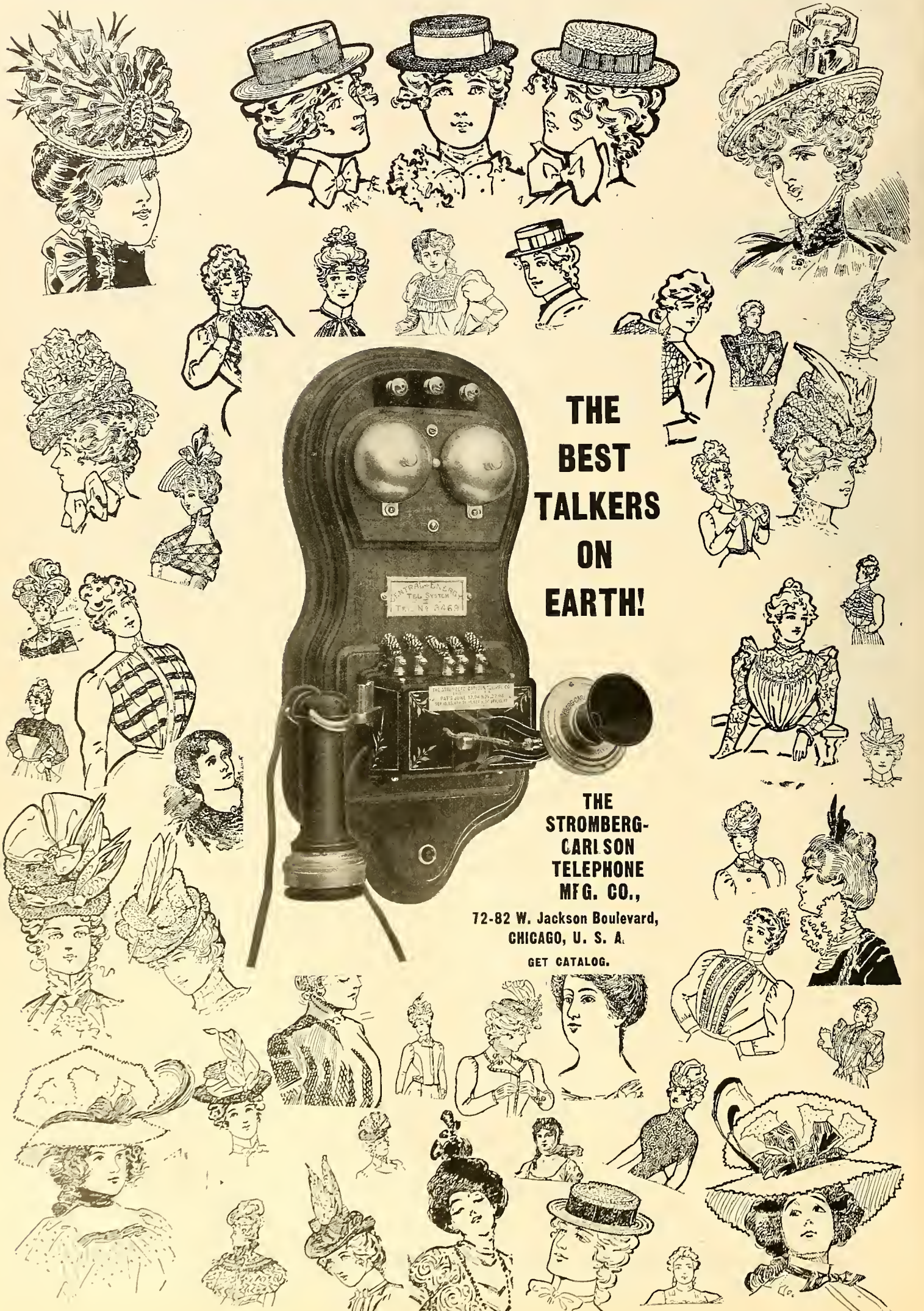
76 Coleman Street, E. C., and North Woolwich, E.

ANTWERP,

33 Rue Baudewyns

PARIS.

46 Avenue de Breteuil.



**THE
BEST
TALKERS
ON
EARTH!**

**THE
STROMBERG-
CARLSON
TELEPHONE
MFG. CO.,**

**72-82 W. Jackson Boulevard,
CHICAGO, U. S. A.**

GET CATALOG.

"SAFETY"

Telephone Wire and Cable.

INSIDE WIRE.

B. & S.	Approximate Decimals.	RUBBER INSULATION.	
20	.032	$\frac{3}{32}$	Plain, without Braid, Single Conductor.
"	"	"	" " " Twisted in Pairs.
"	"	"	Braided, Single Conductor.
"	"	"	" " " Twisted in Pairs.
19	.036	$\frac{3}{32}$	Plain, without Braid, Single Conductor.
"	"	"	" " " Twisted in Pairs.
"	"	"	Braided, Single Conductor.
"	"	"	" " " Twisted in Pairs.
18	.040	$\frac{4}{32}$	Plain, without Braid, Single Conductor.
"	"	"	" " " Twisted in Pairs.
"	"	"	Braided, Single Conductor.
"	"	"	" " " Twisted in Pairs.

OUTSIDE WIRE.

B. & S.	Approximate Decimals.	RUBBER INSULATION.	
16	.051	$\frac{3}{32}$	Plain, without Braid, Single Conductor.
"	"	"	" " " Twisted in Pairs.
"	"	"	Braided, Single Conductor.
"	"	"	" " " Twisted in Pairs.
16 B. W. G. Hard Drawn Copper,	.065	$\frac{5}{32}$	Braided, Single Conductor.
" " " " " "	"	"	" " " Twisted in Pairs.
" " " " " "	"	$\frac{6}{32}$	" " " Single Conductor.
" " " " " "	"	"	" " " Twisted in Pairs.
14	.061	$\frac{5}{32}$	Plain, without Braid, Single Conductor.
"	"	"	" " " Twisted in Pairs.
"	"	"	Braided, Single Conductor.
"	"	"	" " " Twisted in Pairs.

AERIAL TELEPHONE CABLES.

B. & S.	Approximate Decimals.	RUBBER INSULATION.	
18	.040	$\frac{5}{32}$	Taped and Braided.

Aerial Cables from 2 to 51 Pairs.

Underground RUBBER-COVERED Lead-Encased Telephone Cables in any number of pairs desired

"SAFETY" SUBMARINE CABLE FOR TELEPHONE USE IS A STANDARD.

WE REFER TO ALL THE LEADING BELL TELEPHONE COMPANIES OF AMERICA.

Prices Furnished on Application.

THE SAFETY INSULATED WIRE & CABLE CO.,

225 to 239 West 28th Street, NEW YORK.

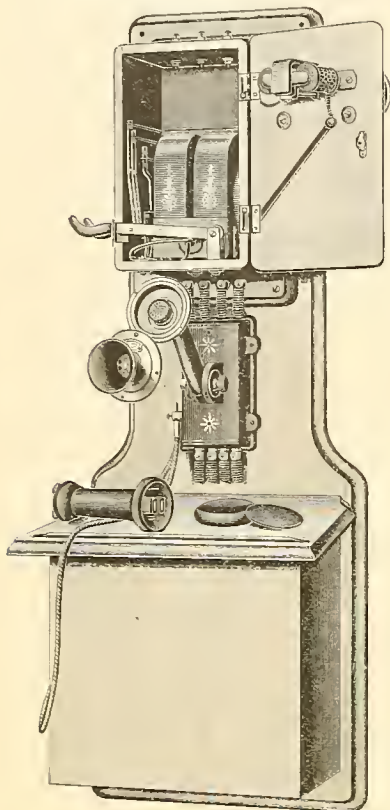
M. B. AUSTIN, Monadnock Block, CHICAGO.

COL. E. J. SPENCER, Security Bldg., ST. LOUIS.

LEONARD F. REQUA, General Manager.

THE VICTOR TELEPHONE MFG. CO.

THE PEERLESS.—Victor Exchange and Long-Distance Wall Set.



STYLE C.

The Victor Telephone Mfg. Co.'s Telephones are the Most Reliable in the World.

We are prepared to fill your orders promptly on Telephones and Telephone Parts.

...TEN REASONS...

Why you should have the instrument illustrated here in your exchange.

1. It has a guaranteed 12,000-ohm generator with noiseless wide gear and durable automatic shunt.
2. The ringers have a centrally pivoted armature, are very sensitive and easily adjusted.
3. The receiver is of the double-pole, bell-flare type, with hard rubber shell, and adjusted to heat and cold.
4. The transmitter head is made of heavily finished castings, is absolutely moisture proof, with a screw adjustment on the back electrode to give it any degree of sensitiveness; it can be removed in an instant and has no false vibrations.
5. The transmitter arm is hollow, containing cord; it has no exposed cords to be broken.
6. The induction coil is wound in even layers to a standard 500-ohm resistance with silk insulated wire.
7. The long lever switch has German-silver springs and Platinum contacts.
8. The cabinet is substantial, neat in design and well finished.
9. All connections are soldered and can give no trouble.
10. Because the instrument, taken as a whole, is durable, simple and efficient.

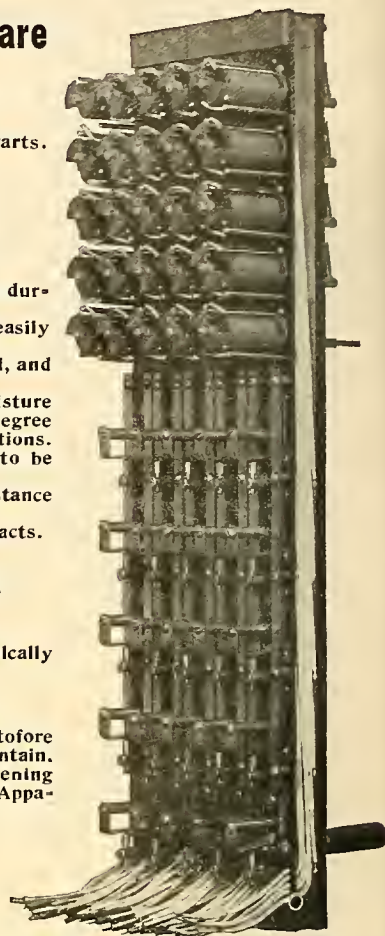
VICTOR SWITCHBOARDS.

Our metallic switchboard Apparatus is new, scientifically correct, mechanically perfect, up to date on all labor-saving and rapid switching devices.

CENTRAL ENERGY SYSTEM.

The Victor Central Energy System overcomes many disadvantages heretofore encountered in this system. It is correct, cheap to install, economical to maintain. All power for signaling and talking supplied from central station. No listening on part of operator necessary. Automatic clearing-out drops. All Victor Apparatus fully protected by patents.

WRITE US.

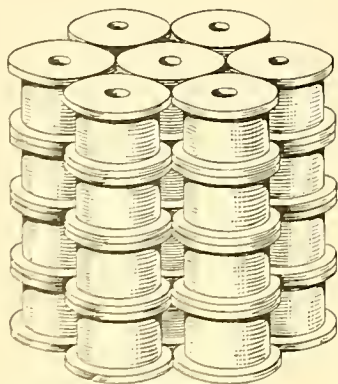


Back View of Five Five-Drop Sections.

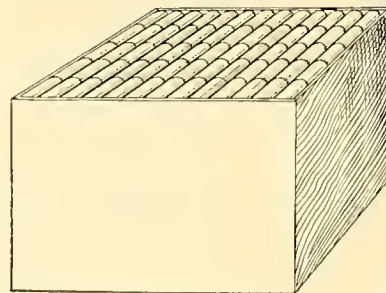
THE VICTOR TELEPHONE MFG. CO., 166 S. CLINTON STREET, CHICAGO.

Telephone Men and All Users of MAGNET COILS—

Have Your MAGNET COILS Wound BY MACHINERY.



HERE'S THE OBJECT LESSON— A PLAIN FACT.



The 2 1/2-lb. spools (9 1/2 lbs. total) of No. 36 single silk-covered wire will cost you \$243 net at 50, 10, 10, 5 off list; and there is sufficient wire on these 2 1/2 spools to wind 1,000 500-ohm bridging-bell magnets. Your winding labor will cost you at least \$5 additional, making a total cost of your own 1,000 magnets finished at factory, \$248.

The above box contains 1,000 "Duplex" magnet windings. Each winding is made up of No. 36 wire, 500 ohms per winding, and each winding has 12 per cent. more turns than there are in the ordinary wound magnet. Price, \$218 70 net. This is 10 per cent. less than your wire bill and we charge nothing for winding.

THE VARLEY DUPLEX MAGNET CO.,

138 7TH ST., JERSEY CITY, N. J.,

DOES IT BY MACHINERY.

We can Save You CONSIDERABLE Money.



*Accept our offer
of a perfect insulation
and better your plant.*

...Okonite...

The Standard for Rubber Insulation.

Central Electric Company,

264-266-268-270 Fifth Avenue,

....Chicago....

Switchboards,
Distributing Boards,
Party Line Apparatus.



Cable Terminals,
Protectors,
Tubular Fuses.

CHIEF OPERATOR'S DESK AND MONITOR.

Apparatus Similar to that Used in Bell Exchanges Manufactured by

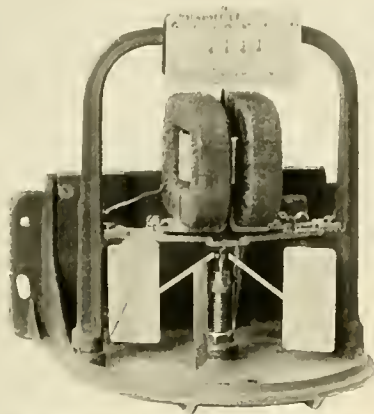
STERLING ELECTRIC CO.,

71 AND 73 WEST ADAMS ST., CHICAGO.



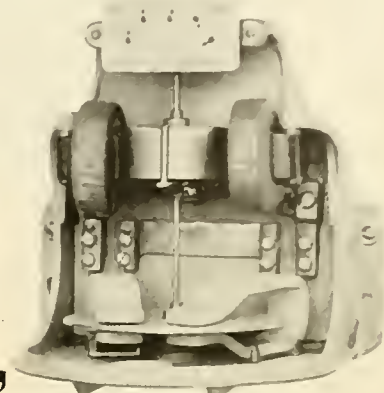
1,000-Drop Sterling Board Showing the Distributing Board at the Left.

Standard Fort Wayne Duncan Meters



INTEGRATING LAMP AND AMPERE-HOUR METER.

Have been made in our factory without interruption for five years, and we are still making them. For extreme simplicity the lamp or ampere-hour meter has no equal and it does its work well. The adjustable friction compensator is a device peculiar to our watt-hour meters—they start on one-half of one per cent. of full load. If you do not know all about the **Standard Fort Wayne Duncan Meters** and just where and how they are made, drop us a postal for our new pamphlet. Don't forget the name.



INTEGRATING WATT-HOUR METER.

FORT WAYNE ELECTRIC WORKS (Incorporated),
FORT WAYNE, INDIANA.

FREE GIFT TO ENGINEERS!

VALUABLE WATER FRONT LOT IN KINGS COUNTY, GREATER NEW YORK, TO ANY CHIEF ENGINEER SENDING HIS BUSINESS AND PRIVATE ADDRESS.

WRITE FOR PARTICULARS.

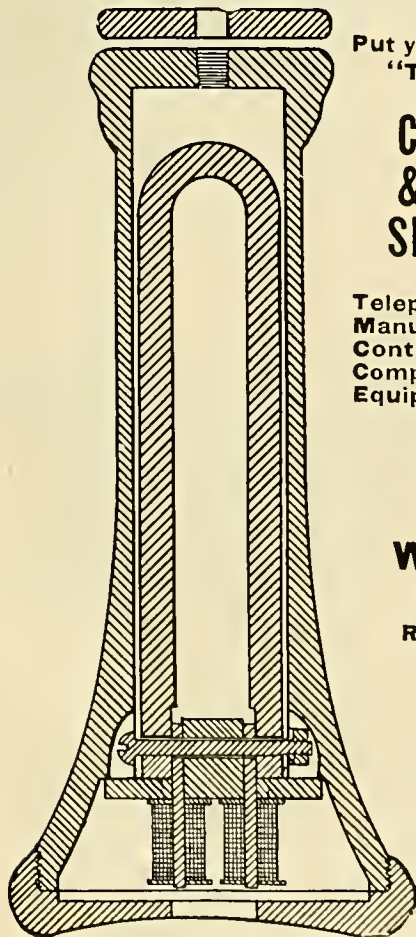
We analyze Feed Water FREE and prescribe the remedy.

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(EDW. E. GRAVES, Presl.)

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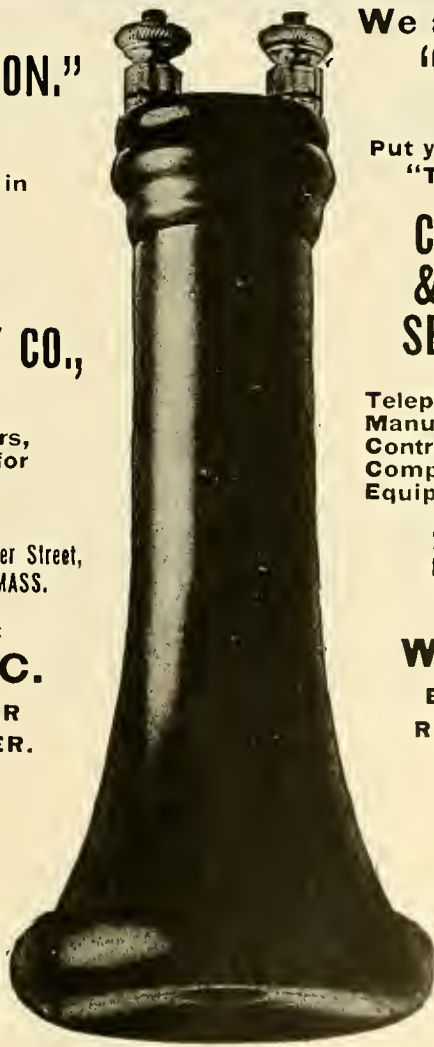


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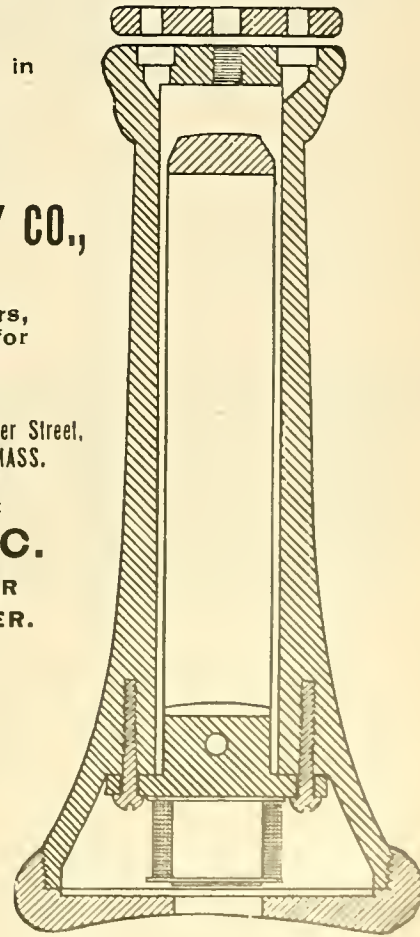
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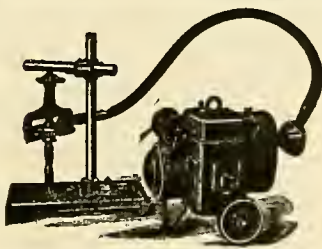
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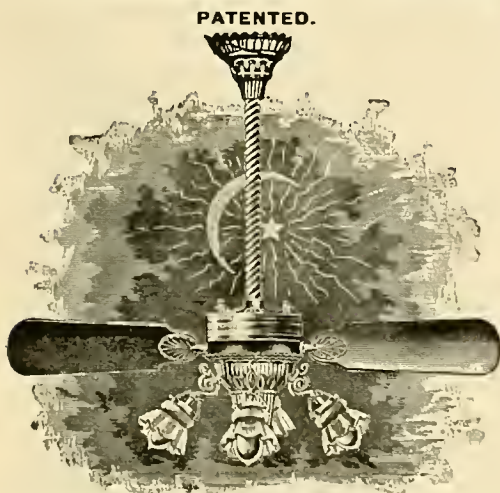
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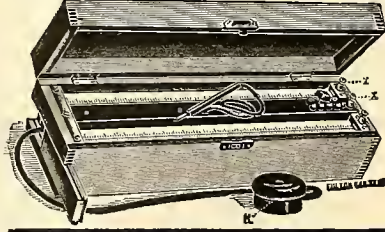
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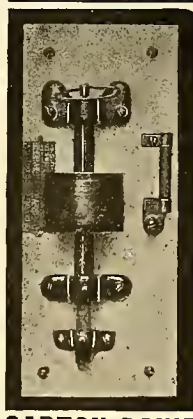
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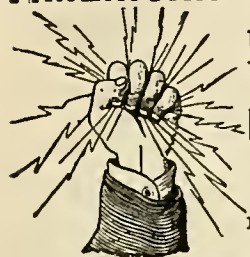
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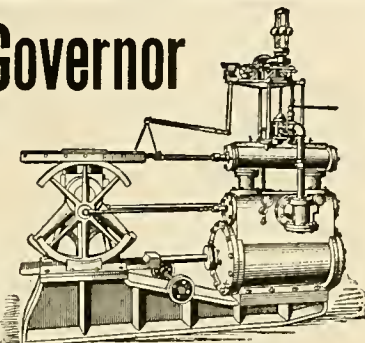
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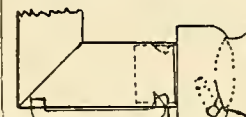
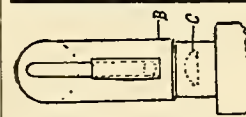
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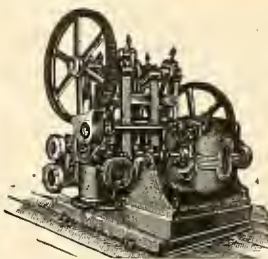
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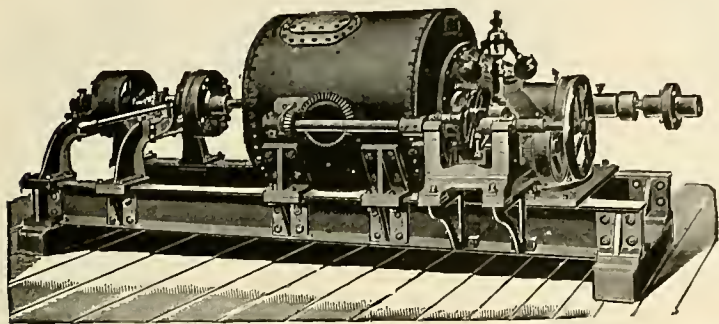
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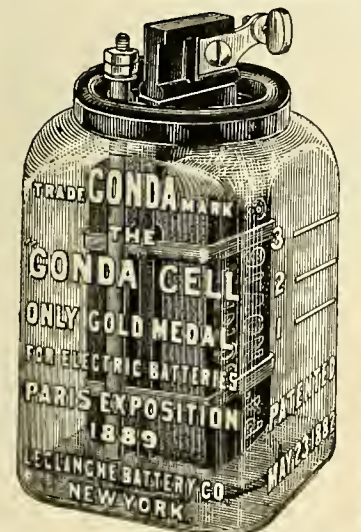
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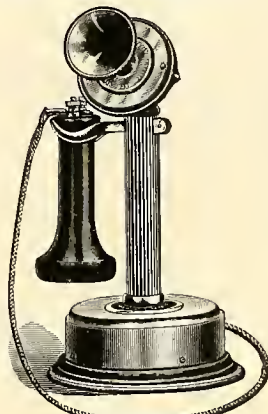
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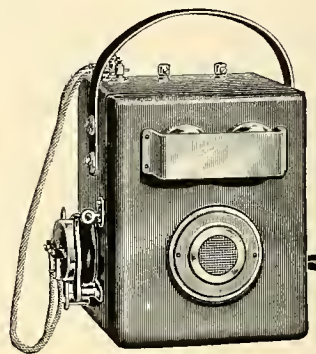
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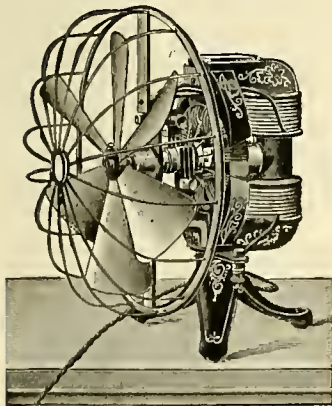
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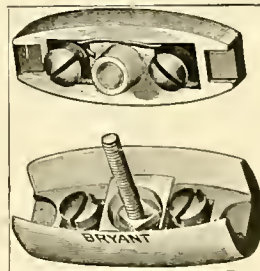
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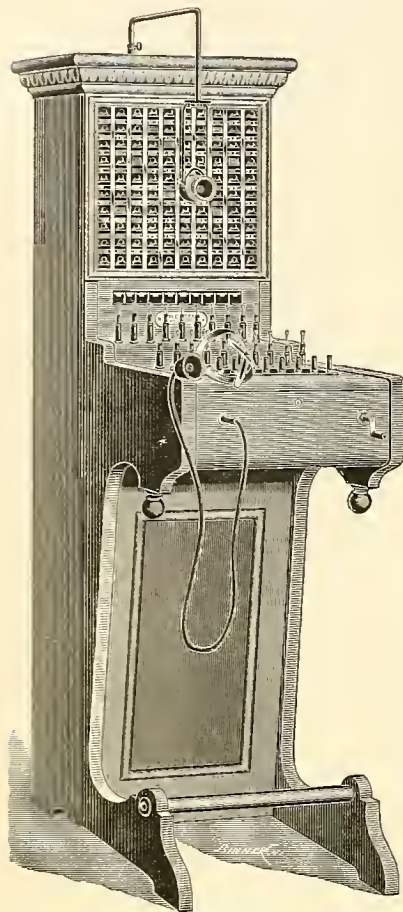
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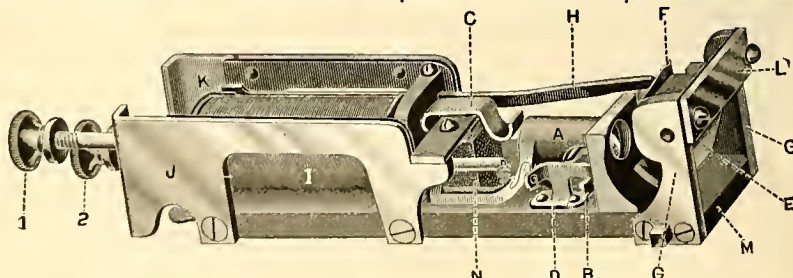
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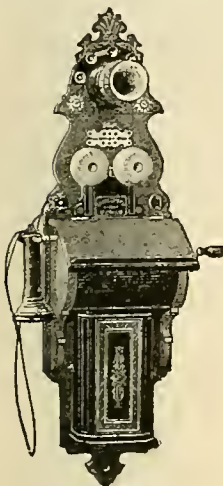
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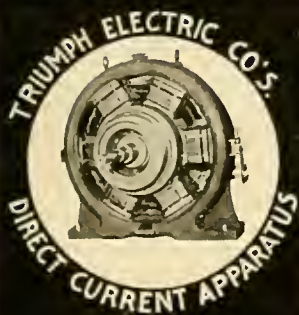
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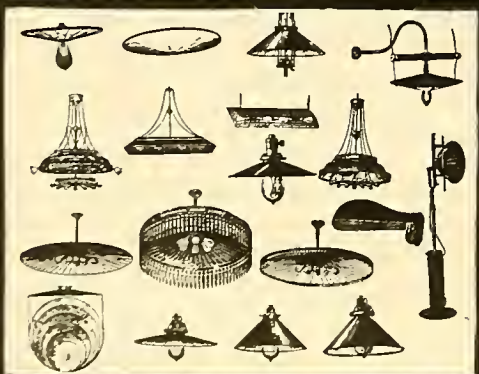
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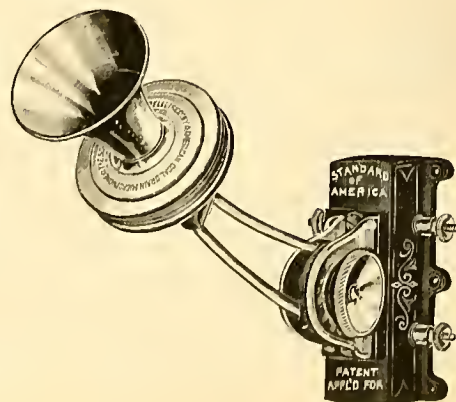
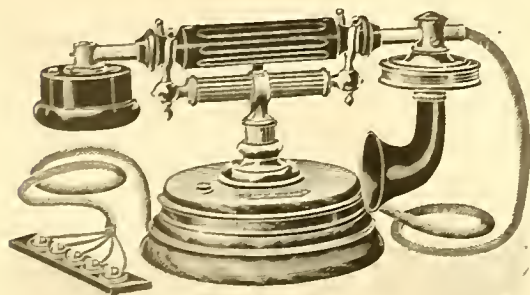
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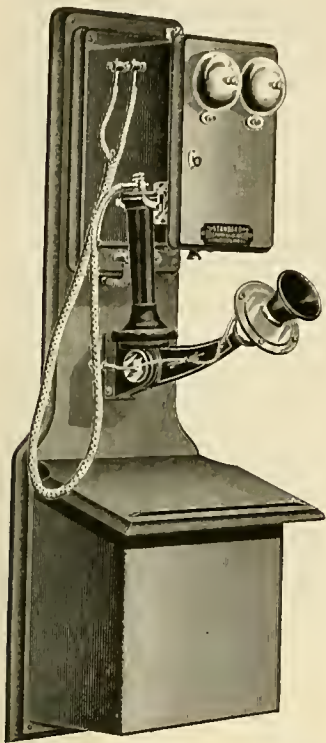
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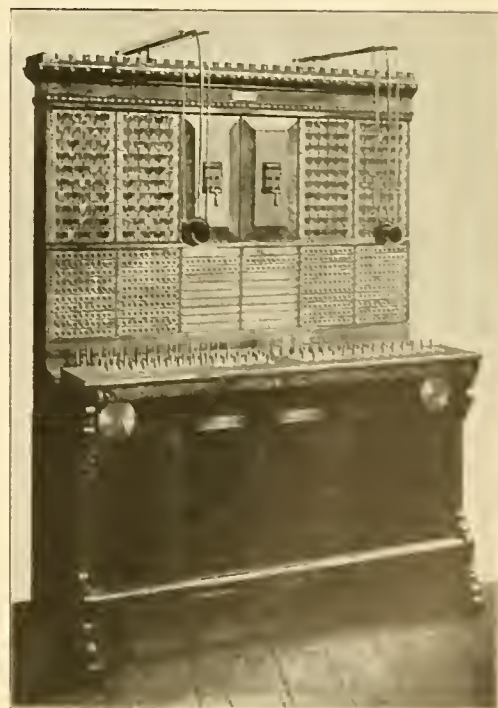


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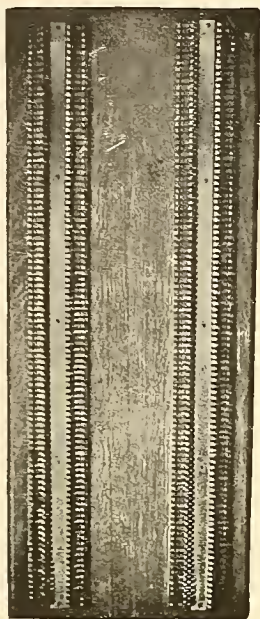
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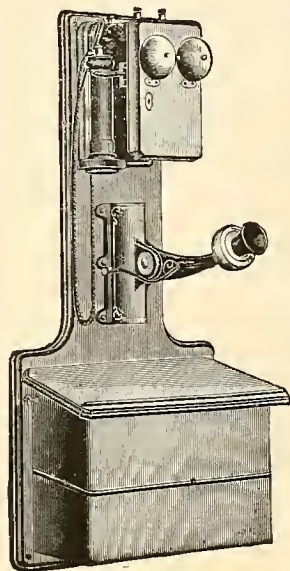
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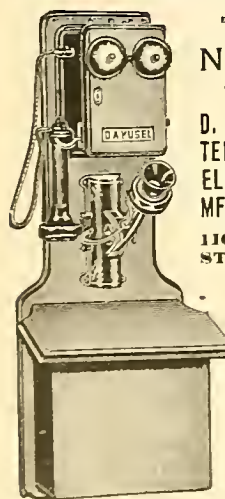
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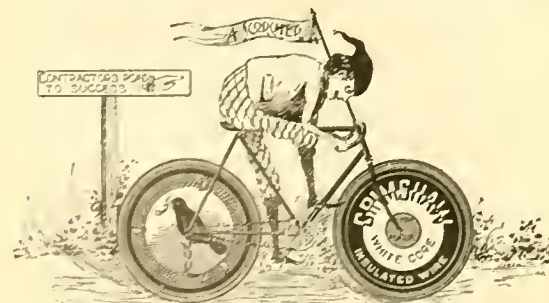
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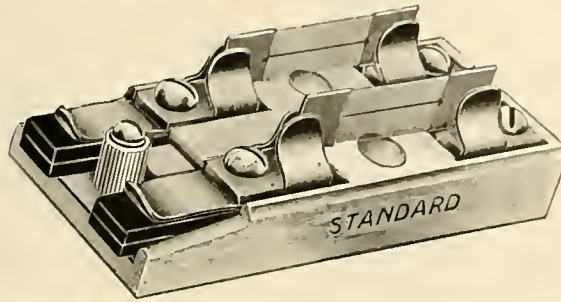
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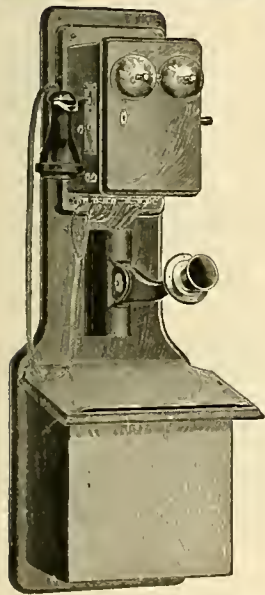


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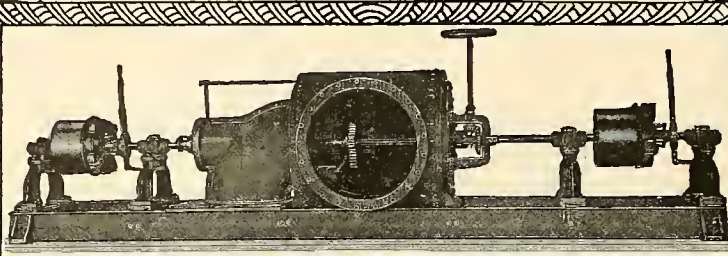
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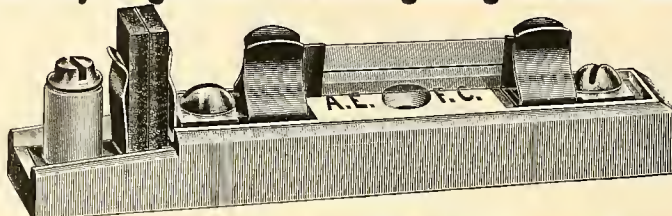
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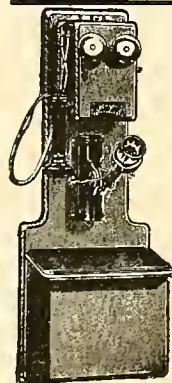
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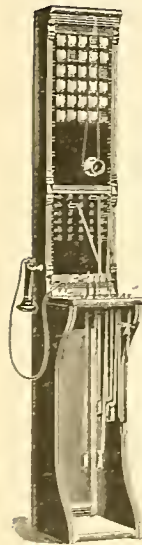
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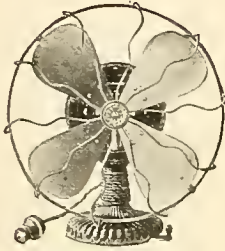
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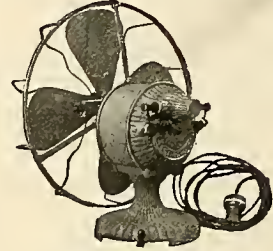
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